AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Large, Self-feeding Ripping Saw.

The machine shown herewith is known by the builders, J. A. Fay & Co., Cincinnati, O., as their New No. 2½. It is designed for ripping material into parallel strips in planing mills and in all kinds of establishments where considerable quantities of lumber are used.

As will be seen the frame of the machine is of iron, made with plate sides and ends heavily ribbed.

The steel saw arbor is 1⅞ inches diameter where the saw is fitted, and is mounted in long connected boxes in the inside of the frame. The arbor is so constructed that several saws may be used at one time if desired. The arbor pulley is between the bearings and permits of being belted to from either direction. Saws up to 22 inches in diametermay be used, and the machine will rip 23½ inches wide.

The self-feed is strong, and consists of a feed shaft carrying a toothed disk for feeding, and a shaft carrying either a fluted or a smooth roll for discharging the material, both mounted in a frame provided with adjustment for regulating the pressure. When it is desired to use the machine as a hand-ripping saw the entire feed mechanism can be lifted out of the way. There are two speeds for the feed, 85 inches and 115 inches per minute.

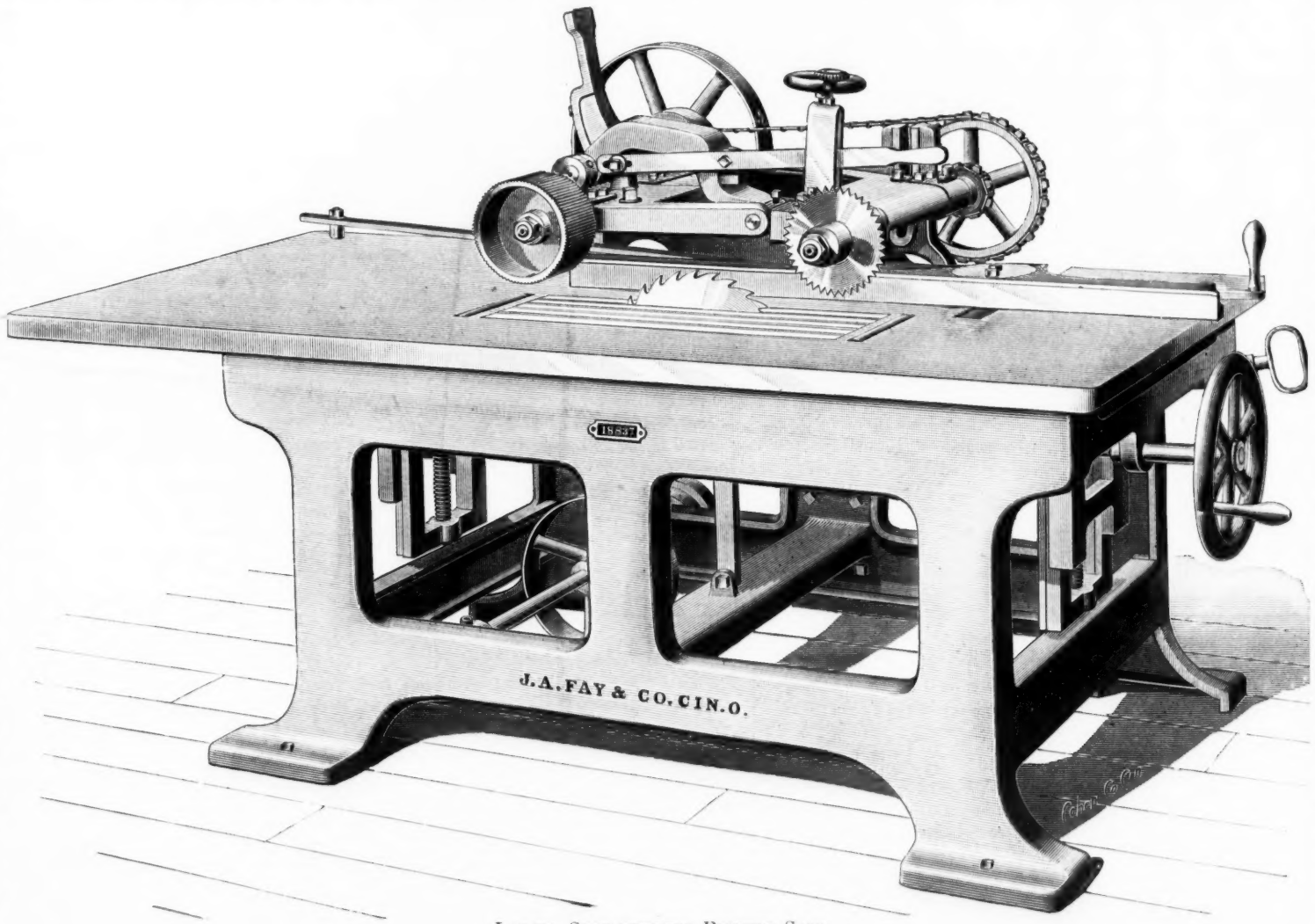
The table may be of either iron or wood. It is 38x78 inches. It is connected to planed stands on which it may be raised or lowered by a screw and bevel gears, operated by a hand-wheel. Adjustment is provided for keeping the table level at all times. The section around the saw is detachable, so that heads for gaining, rabbeting, etc., or a series of saws for ripping several pieces at once may be readily applied.

The fence is moved across the table by means of a hand lever, the operation of which instantly releases, moves and locks it in the desired position, an index gauge indicating the distance at which it is set from the saw.

A side roll and bevel fence attachment for making siding can be furnished, which may be set to any angle and thickness. When provided with this attachment the machine makes a desirable siding saw for small shops that do not require a separate machine for this purpose. The same attachment answers for light re sawing.

For convenience in ordering parts there is a shop number on each machine, and a number on each casting.

Wheat is now being shipped from Duluth to Buffalo, a distance of 1,000 miles, by the great lake steamers for one cent a bushel.



LARGE, SELF-FEEDING RIPPING SAW.

Columbian Exhibition Notes—XI.

Editorial Correspondence.

One of the few firms that have nearly or quite enough space in which to display machinery in an effective manner is the Lodge & Davis Machine Tool Company, of Cincinnati, the feature which naturally attracts most attention being the gold and silver-plated lathe which occupies the front central position. This lathe is of the pattern known as their 16″ "tool-room" lathe. The principal parts of it including the entire bed, head and foot-stocks, and the cabinet legs are silver-plated, many of the smaller pieces such as screws, bolts and nuts being gold-plated. The doors of the cabinets are gold-plated and usually stand partially open showing the shelves inside covered with blue silk plush. The lathe accomplishes its object, which, of course, is to attract special attention to the rest of the exhibit which consists of representative specimens of nearly all the tools built by the company, including the "tool-room" lathe without plating. There are four radial drill presses of different styles, one of these being driven by an attached electric motor, and having a new quick return for the spindle, with cone gears for changing the rate of feed, the sliding key being moved by a sliding collar held in place by a spring plunger entering countersinks in the vertical shaft upon which the gears are placed. There are two planers—24″ and 30″, all the shafts and the loose pulleys on these machines being bushed with plain phosphor bronze sleeves. There is a 26″, geared, shifting belt shaper with automatic down feed and having a vise in which the jaw that is usually fixed is swiveled at the center to adapt it to hold taper work.

Cabinet turret lathes and screw machines of various kinds are shown and a number of engine lathes ranging from 16′ to 36″ triple geared, the latter having the inside shears lower than the outside ones as shown in Fig. 53 (page 2), the object of this being to get room for sufficient depth of the saddle over the inside shears to give the desired strength and stiffness. There is a universal and a plain milling machine, and a line of "standard" two-column drill presses with which our readers are sufficiently familiar to make further description unnecessary. In all these tools, such bolt-heads, nuts and other small parts as we are accustomed to see case-hardened are of steel, hardened, highly polished and tempered, with the temper color left on them, the other parts of the tools being also highly finished.

Next comes the exhibit of E. W. Bliss Co., and the Stiles & Parker Press Co., of Brooklyn, this consisting for the most part of machines which are well-known to our readers and most of which are shown in operation. These include a large toggle joint drawing press suitable for drawing blanks up to 44″ diameter and to a depth of 14″, this being driven by the new friction clutch driving mechanism which we recently illustrated, giving perfect control of the machine at all times. It is operated here in drawing dish pans. There are two other smaller but similar machines besides a full line of the other and older forms of drawing presses, which are also shown in operation. Besides these there are drop hammers, rotary gang slitting machines, double seamers, lock former, a new embossing press, and, in show cases, specimens of the various kinds of work made by such machines as are exhibited, the whole forming a very interesting and instructive feature of the machinery show.

The new embossing press spoken of has a stationary upper die, the lower die being moved vertically by means of a combined crank and toggle joint movement, no gears being used for this but the motion being taken direct from the fly-wheel shaft on which there is a friction clutch. This machine is at work making Columbian souvenir spoons of aluminum bronze, the work being very finely executed. The gang slitter previously mentioned has an attachment by which the disk shears are ground in place on the arbor and within the machine so that absolute trueness is assured.

The National Machinery Company, of Tiffin, O., who make a specialty of bolt and nut machinery, including bolt forging,

threading and nut tapping machines, show specimens of these with which our readers are familiar, they having been illustrated in our columns. Two forms of multiple spindle upright tapping machines are shown, one in which the spindles are arranged in a straight row, and another in which ten of them are arranged in a circle and travel around a central column, this being called

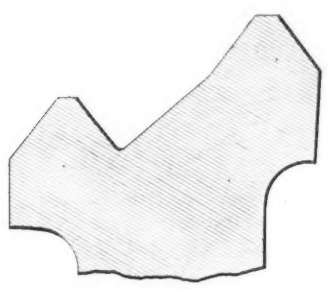


Fig. 53

the rotary machine. In this all the spindles are driven from a central spur wheel which is fixed at the center, pinions on all the spindles engaging with it. The spindles are raised at the proper time by means of worm threads at the top which engage with suitable rack teeth. The taps are removed and the tapped nuts taken from them as they come around in front of the operator. The pan and holders in which the blanks are placed of course rotates about the central column with the spindles.

That which attracts most attention in this exhibit, however, is the forging and upsetting machine which seems to be an outgrowth or development of the bolt heading machine, for which work it is still adapted as well as for general forging. Some specimens of work done on one of these machines are shown, these having been made by another concern which has one of the machines in use, the forgings having been sent on here since the opening of the exhibition. At Fig. 54 sketches of a few of these are shown with figures marked on them to indicate sizes. In every case these forgings were made by one motion of the machine, and the limit of its capacity for such work seems to depend upon the facilities for heating and handling the work rather than upon the machine itself.

The piece *a* is formed from a flat bar $6\frac{1}{2}$ ′x $1\frac{1}{2}$″, the boss being formed at one motion and the flat portion drawn down tapering afterwards under the hammer. Each end of *b* is formed at one motion, and this is true also of the pieces *c* and *d*. The sketches do not show the fins left by the dies, though these are left upon the forgings to show their actual condition as they come from the machine.

Another machine which has a familiar appearance to readers of the AMERICAN MACHINIST is the turret drill press built by Mr. A. D. Quint, of Hartford. This was illustrated and described in our issues of December 10, 1891, and September 1, 1892. Mr. Quint himself is here to show the working of the machine, and as this is something new in machine tools it naturally attracts a great deal of attention. For tapping Mr. Quint has added a spring to such a knock-off die or tap-holder as is usually employed in a screw machine, this spring serving simply to keep the two parts of the holder together and the pins locked when the spindle is in a vertical position. The spring is, however, so proportioned that it is barely sufficient to support the weight, and in tapping, when the stop comes into contact with the work, the tap draws the pins out of engagement in the same manner as is done in the screw machine, the spring automatically restoring the parts to their proper position when the tap is backed out.

The Narragansett Machine Company, of Providence, have six-foot lathes on exhibition, which are intended mainly for amateurs' use and to sell at a low price. The beds of these lathes have a new form which is shown in the sketch, Fig. 55, which may be taken as a cross-section of the bed at any point between the two ends, the carriage resting in front upon the flat surface *a*, but being guided solely by the plain bar *b* which is fixed in the bed at each end, the carriage being fitted to it by boring. The lead-screw is at *c*, and *d* is the plate which forms the end of the bed. The carriage does not fit over the outer edge of the bed in front but merely rests upon the flat surface on top, this portion of the carriage having, of course, no tendency to lift, and the guiding being done by the cylindrical bar at the back.

As would of course be expected, the Billings & Spencer Company, of Hartford, Conn., make a very fine display of drop forgings and finished small tools, their display board and show-cases being filled with specimens of work of the highest grade. Drop forgings in iron, steel, copper, bronze and aluminum are shown, ranging in weight from $\frac{1}{16}$ of an ounce to nearly fifty pounds, many of them being of the most intricate shapes and difficult to produce. With most of these our readers are familiar, while others are not so well known. Amongst the more difficult specimens may be mentioned steel propellers for government torpedo boats, carriage pole-crabs, bicycle parts and bronze forgings for parts of engines of torpedo boats. Their well known small tools for shop and machinists' use are fully represented, and they are exhibiting among other things a new belt fastening, which

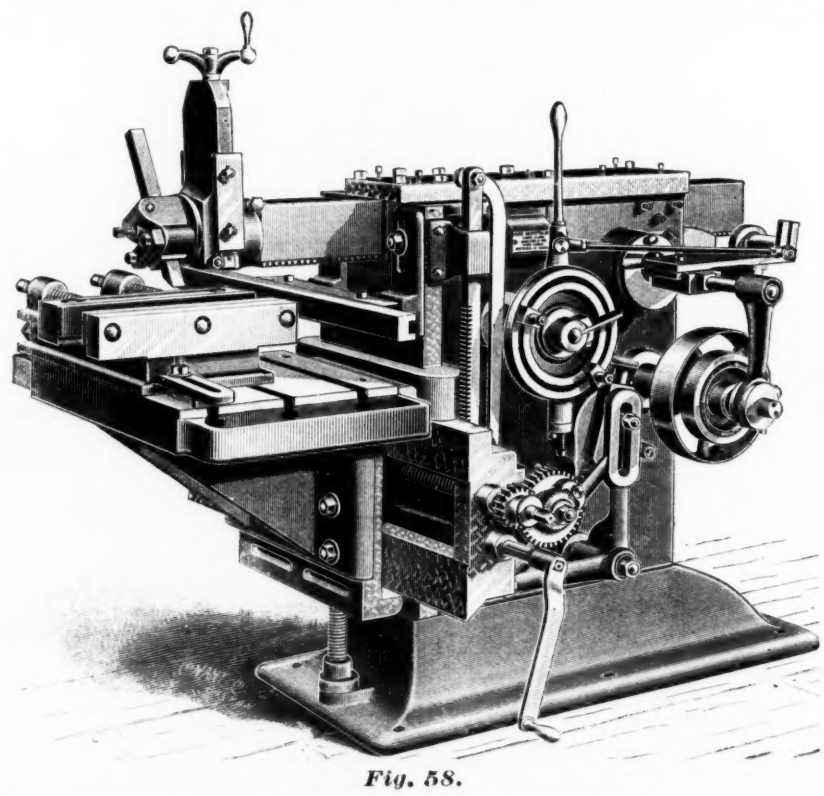


Fig. 58.

has been devised by Mr. W. A. Davis, who is in charge of the exhibit. This belt fastening is shown by the sketch, Fig. 56. It is made in two parts, one of which is essentially a countersunk head machine screw, the other part being tapped to receive it. Holes are first punched in the belt in the ordinary way and the lower part of the fastening put through, the other part being then screwed to place with an ordinary screw-driver. As many of these may be put in as is necessary; they do not destroy the flexibility of the belt and do not project from it in the least on either side. The parts are made upon automatic screw machines, and are ready for use just as they come from the machine except for the slotting operation. This is thought to be something new in the way of a belt fastener, and is a good one. Ordinarily the belt is scarfed down so that the joint is not thicker than the rest of the belt, but for rubber or canvas belts a welt is put on the outside of the belt and extra long fasteners are used to go through the two thicknesses. The usefulness of the Billings belt clamps for tightening belts without removing them from the pulleys is shown by the fact that those that were brought here are in almost constant use in Machinery Hall.

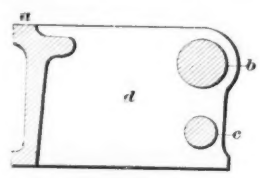


Fig. 55

Fig. 56

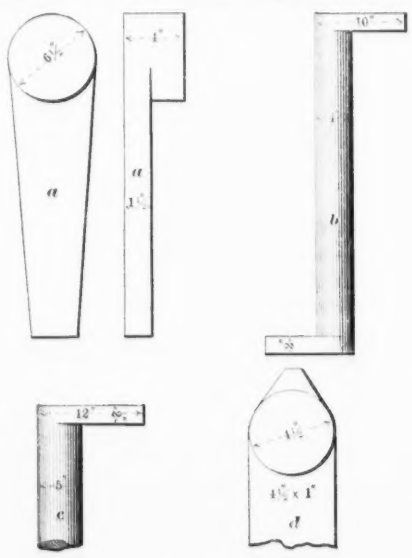


Fig. 54

The E. Horton Chuck Co. have a display of chucks of all sizes from 42″ regular and special chucks, such as used for car-wheels, down to the smallest drill chucks, and with many styles of jaws to suit all kinds of work, a pyramid of these chucks appearing in our illustration of Machinery Hall, issue of June 15.

The Standard Tool Co., of Cleveland, O., have cases filled with specimens of their twist drills, reamers and special tools; and they also show an improved and very simply constructed twist drill grinder, the efficiency of which is shown by operating it for those interested. In their show case is a twist drill 6″ diameter. It has a taper shank larger than any regular size of the Morse taper, though in the same proportion, the length of the drill over all being 32′, and its weight, finished, 193 pounds. It weighed 100 pounds more than this in the rough. In making up their display boards they have made use of drills of various diameters that are of unusual length, one of these being 12 feet long and bent to form a rectangular frame which incloses a display of small drills, the smallest of these being No. 80—.013″ diameter.

The Morse Twist Drill and Machine Co., of New Bedford, Mass., have a fine display of their tools, and among them some that are not so well known as their regular drills, reamers, etc. Of these may be mentioned drills with a copper tube soldered into a small spiral groove, these being made for use in the drilling machine made by the Hendey Machine Co., which was illustrated in our issue of March 9, the object of the tube being to force oil through to the point of the drill. There are also some very large three-grooved reamers for use in cored holes, these being somewhat similar to a twist drill except that they have three spiral grooves instead of two, and in the middle of each "land" there is a shallow groove milled, thus dividing up the bearing surface upon the outside of the tool into six parts, there being no circular clearance or backing off, but only a slightly diminished diameter towards the shank. Such a tool is found to work very well in removing stock from a cored hole or from one that has been previously rough drilled. There are drills also that have a hole drilled crosswise through them from one groove to the other, where the grooves join the shank, this hole communicating with a hole which passes lengthwise through the center of the shank, such drills having not the usual form of shank, but a short and relatively large shank, which is threaded externally to fit the end of a steel tube which forms the real shank of the drill. The lubricating material is forced through this tube, the chips passing through the holes in the drill and out through the tube. This drill has become a regular article of manufacture, largely as a result of a discussion of the matter of deep hole drilling in our columns some years ago, in which this method was illustrated and described by one of our correspondents—Mr. Landis, I think.

They are now making milling cutters in two parts which interlock, and can be packed apart by washers to maintain the size—such cutters as have for a long time been made in sewing machine shops and other places, but have not until recently been made regular articles of manufacture, as these specimens show them to be.

The Cleveland Twist Drill Co. also make an interesting display of drills, reamers, and other small tools, their newest things having been illustrated in our columns, with the exception of a collar, which they show in connection with their reamer display, the purpose of this collar being to assist in getting two or more reamed holes in line with each other. The collar is shown in the sketch, Fig. 57, and is simply a stepped conical sleeve which is ground out to fit the shank of the reamer, and is of various sizes outside to suit the reamer which may precede it. After one hole has been reamed this collar is slid down into it, and centers the shank of the reamer while the other hole is being reamed. Plain conical sleeves have been used for this, but are not so satisfactory, because they do not have so good a bearing in the reamed hole, and are thrown out if the work is not previously faced true

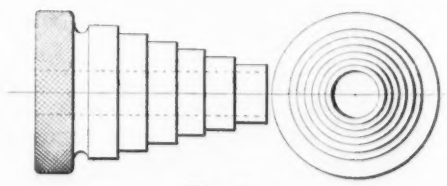


Fig. 57

with the hole, which often is not the case. The sleeves are hardened and ground to size.

Amongst the tools which attract most attention here are those exhibited by the Morton Mfg. Co., of Muskegon Heights, Mich. When a shaper of about the size and weight of any ordinary 24″ shaper is seen taking a cut from a cast-iron plate and curling off chips 2″ wide with a feed of $\frac{1}{13}$′, machinists know that there is something new to be seen and they stop and look, while others who are not machinists, but

are invariably attracted by the sight of such work, also stop, the result being that Mr. Morton usually has a pretty good sized audience, and is one of the few exhibitors that express themselves as being very well satisfied with their World's Fair experience.

At Fig. 58 is an engraving showing this shaper, while Fig. 59 is a view of part of it, showing how it does its work, *i. e.*, backwards. An inspection of the engraving will show that the shaper resembles other geared shapers in its main features, but the head and clapper box are so arranged as to adapt it for cutting on the return instead of at the out stroke, the result of this arrangement being that, when the cut is on, the tendency is to pull or push the machine together, so to speak, instead of to dismember it. There is apparently no other reason for the fact that this 24″ shaper (capable, however, of planing up to 26″ and weighing 5,200 pounds) should be capable of taking a cut 1¾″ deep on cast-iron with a feed of 13 to the inch, and doing it with such apparent ease that no one doubts Mr. Morton's modest statement that it can do more than that, and would be doing it were it not for the fact that providing castings for it to chew up would become too burdensome in these hard times.

The ram in this machine is seen to be a simple bar of rectangular section, being in this machine 4½″ wide and 5″ deep, driven by rack teeth at the bottom and having a full bearing on all sides. A crossed belt is on one side of the machine and an open belt on the other, friction clutches serving to change the motion. Another advantage which this machine seems to possess is in the fact that lines showing the desired shape of a piece of work can be so placed on the front side as to be in full view of the workman, and the tool can be made to cut to them without breaking away the corners of the work, or throwing up a burr to cover the lines.

This machine is the outgrowth of another machine which is shown in the exhibit, and which we have illustrated and described. It is the Morton key seater, which we illustrated in its regular or stationary form, Fig. 60, showing it in its portable form, where it is fastened in any convenient way to the hub of a large pulley or wheel, and the key-seat planed, the cutting

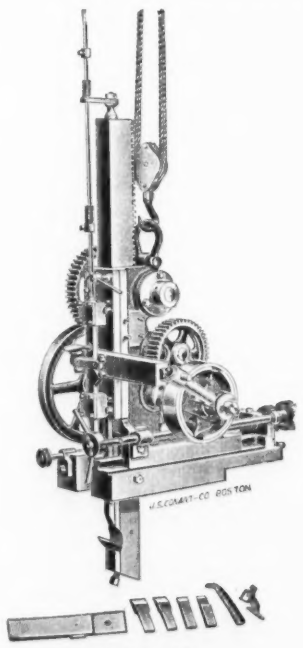


Fig. 60.

being done upon the up stroke, thus tending to seat the machine more firmly in its place and consolidate it instead of the opposite. In this machine there is but one belt and friction clutch, gravity serving for the down stroke of the bar; and one of the curiosities of the machine is to see it stopped by tightening the clamp screw in front of the ram, thus preventing its descent to the point where the tappet throws the clutch for the up stroke.

Though a portion of the windows near the top of Machinery Hall annex have been placed on pivots so that they can be opened to let part of the hot air escape, there seems to be plenty of it yet to make things decidedly uncomfortable in hot weather. That portion of the main aisle which traverses the machine tool district has a number of openings or trap doors going through the floor to where the steam pipes are placed. To day one of these was standing open and the usual hot air blast was coming up out of it, when an exhibitor, who happened to have nothing else to do and was probably anxious to devise some means of relieving the monotony of the situation, succeeded admirably when he fixed up over the opening a paper toy which was revolved by the ascending current of hot air; then on the open trap door he placed a placard bearing the legend, "Hot Air Exhibit." F. J. M.

Jackson Park, July 24.

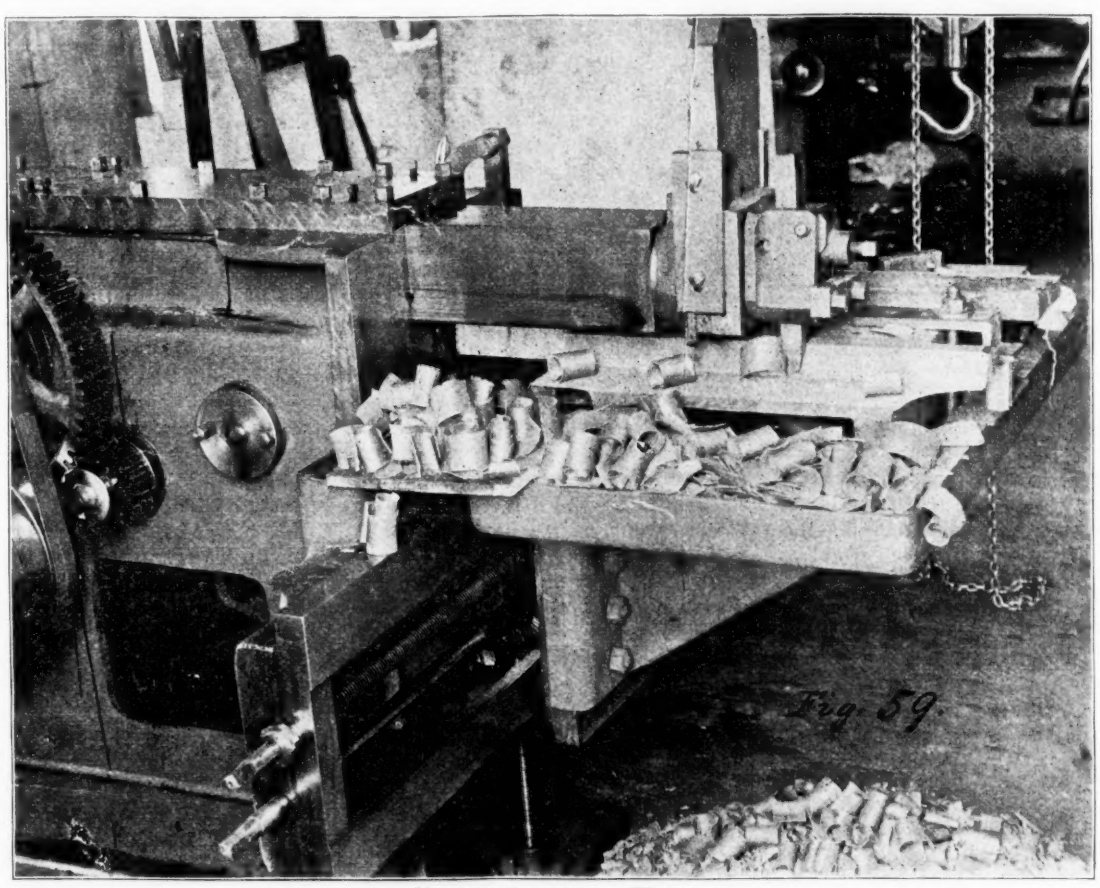


Fig. 59.

MORTON SHAPER AT WORK.

A Leaf From John Johnson's History.

BY C. L. REDFIELD.

John Johnson, which is not the individual's name, but which will do for the purposes of this article, had, in early life, a fondness for mechanical contrivances, and often made them and dreamed about them. It was not his fortune, however, to ever see or know what a machine shop was, until he was old enough to think about going to college. At that time, and for some time previous, his aim had been to be a civil engineer, as that seemed to be the nearest to his desires. About this time he had his first chance to see and learn something of what a real live machine shop was, and when the opportunity offered he gave up college and went to work in the shop at $4.50 a week.

Having started on this career, John determined to learn all that he possibly could, and to this end kept his eyes and ears wide open. He also made it a point not to ask questions about matters that did not directly concern his work, but about which he wished to know, until he found it practically impossible to find out in any other way. When questions evidently became necessary, he usually approached the matter indirectly, hoping, he informs me, to get some hint that would put him on the right track, and thus permit him to find out for himself, and retain a certain amount of self-satisfaction that he would not have had if the thing was explained to him completely. I have a suspicion, however, that a fear of displaying ignorance and subjecting himself to ridicule, had something to do with it, especially as he admits that that fear played a part at a later time in his life. In this way he picked up considerable information, and acquired habits that have since been of help to him.

While working and learning all he could of the things around him, he was continually scheming to find some way to expedite the work he was on, with the result that he seldom quit any particular job without having found some means of doing it more expeditiously than he was taught to do it when he started.

The mechanics that he learned in this shop suited his disposition and inclinations so well that after a year he decided to go to one of the technical colleges and become a full-fledged mechanical engineer. At college he did fairly well, ranking a little above the average, though not the best in anything except perhaps in geometry, in which, I believe, he excelled.

Fate decreed that John Johnson should not finish his course in college, for at the end of his first year his finances became such that he had to hustle for his daily bread. In doing this he drifted away from mechanics, and for a number of years did not see the inside of a machine shop. In the meantime he had arrived at man's estate, and married, and one day he found himself out of a job, without money or credit, and with a wife and baby to take care of. In looking around for something to do, one of the first things that struck his eye was an advertisement for a boy to make tracings. He immediately applied for and obtained the situation, and thus commenced once more on a mechanical career. Previous to this he had been studying shorthand, hoping to fit himself to earn a fair living in this way. Immediately upon securing this situation he threw his shorthand book in the corner, and has not seen it from that day to this, and what is more, he says he doesn't want to.

As soon as Mr. Johnson obtained this new opportunity to follow the business he liked best, he resumed his old tactics of keeping his eyes and ears wide open, and of paying particular and careful attention to everything that he saw or heard. He informs me that at that time he had been so long away from machine shops that he had forgotten the common shop names for many things, and that much of what he heard was unintelligible to him, but that rather than betray his ignorance in these matters he used extraordinary measures to find out what certain terms meant. To this end he visited the shop as often as his duties would permit, and when there, never failed to draw out from the foreman or some workman his opinion in regard to this, that or the other thing connected with the work or the operation of certain tools and machinery. He also bought the AMERICAN MACHINIST and other technical papers, and studied them far into the night. Speaking of this matter, Mr. Johnson says that in the beginning he found extreme difficulty in understanding some of the articles, especially those describing the construction and operation of certain machines, and that he would often spend hours studying a single machine that he could now understand in as many minutes.

When he commenced making tracings he was not able to read mechanical drawings, and made a good many of them without understanding what he was doing, or making any particular progress toward becoming a draftsman, except by acquiring skill in mixing ink and in drawing lines. One day, after he had been making tracings for three or four weeks, the foreman came in with a peculiar wedge-shaped piece having a core in one end, a groove along one side, and provided with a set screw, and said that he wanted a drawing made of it to send away. Without any further explanation the foreman went out and did not return for several hours, a circumstance that seems to have been particularly fortunate for our hero. Mr. Johnson says that he has faced death and danger on land and sea, and that he has often had to exert himself to the utmost for self-preservation, but that he does not believe that he ever wrestled so hard with anything in his life as he did with the problem of how to make that simple little drawing. He had heard somewhere that it took three views to represent a piece by mechanical drawing, and after staring at the casting from different directions for a considerable time he started in and finally got one view to his satisfaction. He then made a second view off somewhere else on the paper, and commenced on a third. As soon as he had started on this third view he found himself laying off the identical dimensions that he had used on the other two views, when it occurred to him that by locating the views in a certain relationship to each other he could take off these dimensions by his T-square and triangle without measuring them. A hasty inspection of some drawings near at hand showed him that each one, without exception, had its views placed in this way. He immediately rearranged his views, and finished a fairly creditable drawing with the feeling that he had learned an important thing. He now declares that from that day he was a draftsman, because he then knew how to go about making a drawing for anything that might come his way. He was not content, however, with having reached that point, but continued his policy of acquiring all the information he could, with the result that he has learned a good many things since that day. He has since held the position of chief draftsman successively with several concerns, and now is ———, well never mind what, nor where he is at present. He probably would not thank me for disclosing his identity with the hero of this.

Upon being questioned as to what course he pursued and what books he studied to make up the lack of having completed his

college term, Mr. Johnson says that whatever success he has had has been "due principally to hard work," and the principle that he has always followed of throwing his entire energy and ability into whatever he was doing. He also says that he has never made up his college deficiency, although I have personally known him to put to rout college graduates and college professors in the solution of technical and mathematical problems.

Being questioned particularly as to what *books* it is best for a young man to study who wishes to advance himself, he says that a fair knowledge of algebra and geometry is essential, and a thorough understanding of physics is very important. Beyond this he seems to think that books should be used for reference rather than study, his idea being to acquire a thorough understanding of the general principles without burdening the memory with a multiplicity of details. In books of reference he ranks those that have tables and formulæ as the most important, and next to them the catalogues of prominent manufacturers, because they show the latest and best advances without encumbering the pages with the old and obsolete.

While there is much truth in what Mr. Johnson says in this regard, I think some modification is essential when applied to persons who follow a somewhat different line from his. For example, the man who intends to make a specialty of steam engineering will find much in treatises on steam engines, valve motions, etc., that he will not find in a book of tables nor in catalogues. I presume, however, that Mr. Johnson would class these as books to be referred to but not studied. There seems to be an opportunity for a difference of opinion here.

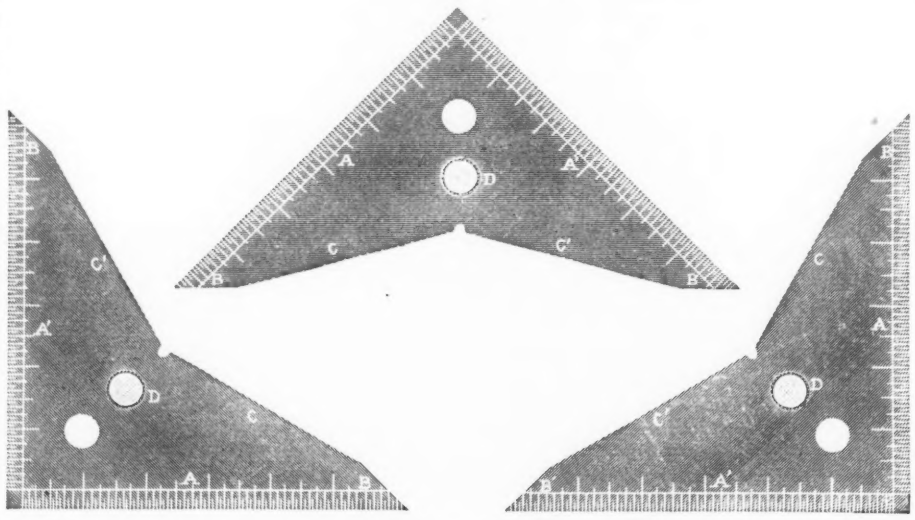
I have found it somewhat difficult to learn exactly what Mr. Johnson's idea is in regard to hard work as an essential to success in mechanics, but from his conversation I assume it to be about as follows: That he spent his evenings in studying over his work of the day in its relationship to what he was to do next day, and in scheming his next day's work as far in advance as possible, so that when he came to it he could push it forward expeditiously and accurately. He informs me that for a number of years he worked in this way about 16 hours a day, 365 days in the year. If I correctly understand his aim in work, it is to concentrate his energies upon the thing immediately in hand, and not to waste time grubbing into the mysteries of the dim past or speculating upon the theories of the indefinite future.

I have felt disposed to comment upon what has been written, and, in some cases, to diverge from the views expressed, but have decided to refrain from so doing, and to confine myself to the part of historian of such things as came to my knowledge, and seemed to me might be of interest and possible help to young men who are endeavoring to struggle upward under many disadvantages.

He Sold Good Set-screws.

I worked for a man when an apprentice whose strong hold was set-screws. He had, for the times, a good shop, with good foremen in the several departments, but individually he had an eye single to set-screws. You didn't buy set-screws then as you do now; every shop made its own. In this shop, making them was the apprentices' job, and they were not made in quantities and stored away, because the next tap would be a little smaller or a little larger, in all probability, than the one that was broke. A set of machines required say fifty set-screws, and some apprentice who was working on those machines got the job of making them, fitting them to each individual hole. It was just about as sure as death that not one of these set-screws would ever get out of the shop as a component part of a machine without having been tried by the "Old Man" as to its quality of *shakiness*. If there was a tendency towards wabbling the young aspirant who made it got a lecture, sure. It would be a mild sort of a lecture—a kind of paternal disquisition on the duty of set screws in general and the particular mechanical vileness of this one that was shaky. The boys all learned to make good set-screws, and the machines that went out of that shop didn't have the weakness of loose ones, whatever else might be their shortcomings. It looked as if the "Old Man" gave a good deal of time to the subject, but then he was eminently successful in the matter. He sold good set-screws.

F. G.



A NEW SET SQUARE.

A New Set Square.

In connection with the articles which have recently appeared in the AMERICAN MACHINIST regarding the use of cross section paper in the drafting room, a description of a new instrument is here given, which in a measure takes the place of ruled paper.

It will be seen from the cut, which shows the instrument in different positions, that it is a 30°, 60°, 90°, 45°, and incidentally a 15° angle, and all this in both directions, without being turned over on the opposite side.

It is, therefore, provided with a small knurled knob *D*, whereby it may be conveniently picked up or turned around, or held firmly against the T square.

The 30° and 60° ruling edges, though but little more than half as long as the others, are still long enough for the great majority of cases, being seldom used except for hexagon nuts.

The instrument is made of transparent celluloid, which keeps its shape fully as well as rubber, and is far more cleanly, and not at all liable to crack.

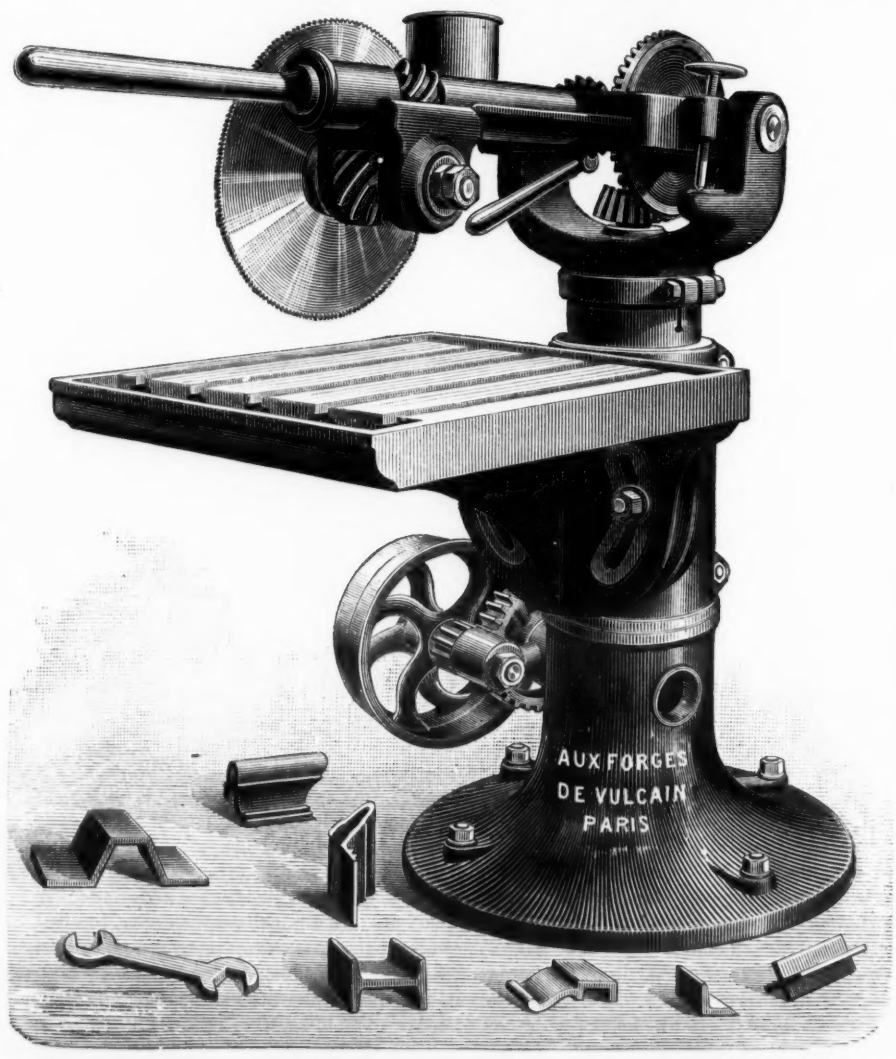
The feature of transparency, with the fact that the instrument is always used the same side up, makes it a practical possibility to have a scale cut on its under surface, thus bringing it into close contact with the work, and rendering accurate measurement possible, the graduations being seen from above through the transparent material.

At the same time, the distinctness of the scale is preserved from the wear of the lower surface, as what is *seen* of it is above that surface.

The graduations, being on the instrument instead of the drawing, may always be made to coincide with the lines of the drawing, which it is often impossible to do with cross-section paper. It is found that this scale upon the triangle saves not only time, but a considerable amount of fatigue from the petty though frequent distraction of placing and displacing a separate tool for every measurement. In addition to the scale a line may be drawn parallel to each long side of the triangle, and about $\frac{1}{4}''$ distant, for convenience in getting right angles when not wishing to use the T-square. The line is clearly seen through the transparent material, and may be readily placed coincident with a line on the drawing, thus giving a ruling edge at right angles to that line and slightly crossing it.

Designers and draftsmen will find this instrument to be very convenient for approximate sketching, as well as ordinary drawing.

It is made in three sizes—6″, 8″ and 10″—by D. J. Kelsey, 32 Cottage street, New Haven, Conn.



COLD METAL SAWING MACHINE.

Cold Metal Sawing Machine.

We present herewith an illustration of a French machine for sawing cold metals, the special object of the design being to provide a machine which would be applicable to any form of work and to cut it any possible angle.

It will be noticed that there is a vertical shaft passing through the center of the column, at the top of which is a bevel pinion, this driving an idler bevel gear, which in turn drives the pinion which is on the end of the shaft that passes through the center of the swinging arm that carries the saw, all these gears being so located with respect to the various center lines, that the arm can be swung horizontally or vertically to any desired angle, while the tilting arrangement of the table enables work to be cut in any direction. Upon the saw arbor is a helical gear which is driven by a similar gear on the shaft above. Provision is made for lubrication of the saw, and it is manifest that the machine should be quite efficient for the work it is intended to do. While such a machine will not, of course, cut off bars as fast as shears will do it, it will without special preparation cut any shape whatever at any angle without deformation and leaving the cut surface fairly straight and true. The diameter of saw used is 400 milimeters (about 15¾″), and the machine weighs 650 kilogrammes (about 1,430 pounds). It is built by the Vulcan Forge, 3 rue Saint Denis, Paris, France.

The Limitation of Engine Speed.*

BY CHARLES T. PORTER.

The practical limitation to high rotative speed in stationary reciprocating steam engines is not found in the danger of heating, or of excessive wear. The causes of both these, it is now well understood, are to be looked for in defects of design or construction, commonly to both, as they generally go together, and where these do not exist to a degree which is of practical moment, a bar to the proper employment of higher rotative speed appears long before a tendency to heat or wear is to be observed. Correct designs are now generally followed, in both the fixed and the moving parts of steam engines, and a high degree of truth is readily attained in their construction, so that it has come to be a simple matter to make engines which can be run at very high speed, quite free from either of these difficulties.

Contrary to the general belief, no objection to very rapid rotation is afforded by the development of centrifugal force in the fly-wheel or band-wheel. This the following exposition will make clear.

The centrifugal force of one pound, making one revolution per minute, in a circle of one foot radius, is .000341 of a pound. This force varies directly as the radius in feet (R), and as the square of the revolutions per minute (r). Hence the expression: $R \times r^2 \times .000341$ gives the centrifugal force in terms of the weight (W). This is a simple and convenient formula.

A handy formula is desirable for the centrifugal force developed in each one square inch of section of the rim of a fly wheel. This is obtained as follows: In a cast iron wheel of one foot radius, measured to the center of gyration of the rim, the value of

*Presented at the Mechanical Engineering Section B of the World's Engineering Congress.

W, for each one square inch of rim section, is 19 6. This number, multiplied into .000341, gives .0066836 as the centrifugal force in decimals of a pound, of this ring, at one revolution per minute. As both the centrifugal force and the weight vary directly as the radius, we have the expression

$$(Rr)^2 \times .0066836$$

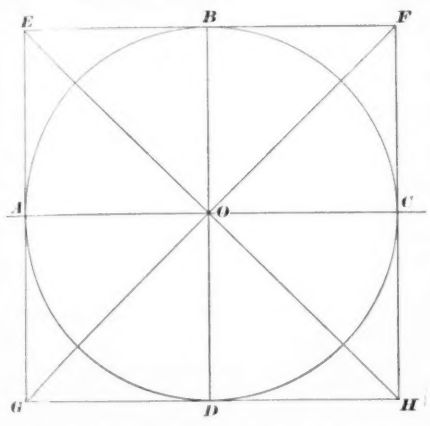
for the centrifugal force developed in each one square inch of cross-section of the rim of any cast-iron wheel. For example, this centrifugal force, in a wheel 5 feet in diameter, making 300 revolutions per minute, is 3,759.5 pounds.

$$(2.5 \times 300)^2 \times .0066836 = 3{,}759.5.$$

This is the sum of the centrifugal stresses, exerted equally in all directions, in the plane of revolution. What is the measure of the tendency of these forces to burst the wheel?

Answer: One-fourth part of these forces, 940 pounds, is resisted by the tensile strength of two opposite sections of the rim. This strength, for good American iron, may be taken at 20,000 pounds per square inch, aggregating 40,000 pounds in the two sections, giving a factor of safety of 40.4. So this wheel may be run at double speed, 600 revolutions per minute, with a factor of safety of 10.

The correctness of the above answer is demonstrated as follows:



Let the circle $A\ B\ C\ D$, in the above figure, represent the rim of a wheel, having its center at O, and of which $A\ C$ is the horizontal, and $B\ D$ the vertical, center line. The equal centrifugal stresses in the opposite directions $O\ A$ and $O\ C$ are resisted at the points B and D, and the equal centrifugal stresses in the opposite directions $O\ B$ and $O\ D$ are resisted at the points A and C.

The amount of the combined stresses, exerted in any one of these four directions, is the sum of the horizontal or the vertical components, as the case may be, of one-half of the total centrifugal force. These components are equal to each other, and are represented, the horizontal by the triangles $E\ O\ G$ and $F\ O\ H$, and the vertical by the triangles $E\ O\ F$ and $G\ O\ H$. Therefore, one-fourth of the total centrifugal force is exerted in each of any four rectangular directions, and is resisted in two opposite sections.

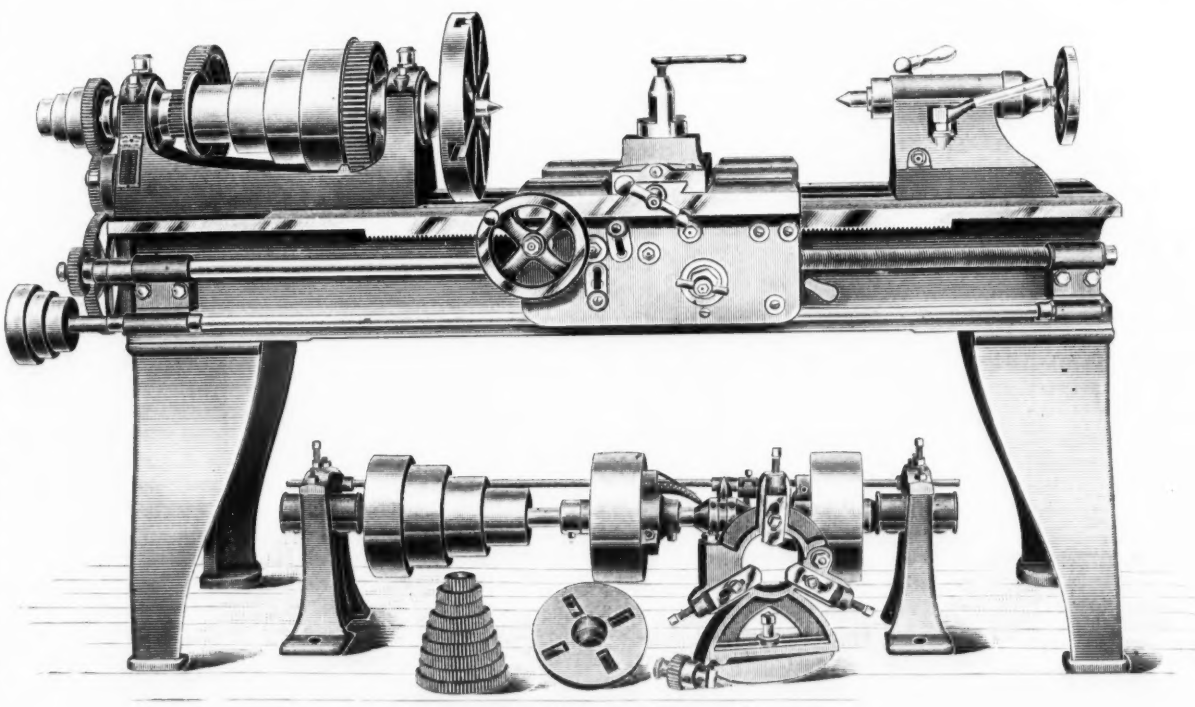
The wheels of high-speed engines have generally solid rims, and no case of their bursting has, I believe, ever been known. Disasters from this cause have been confined to engines not designed to be run at high speed, and have sometimes occurred when the speed was only slightly accelerated above the normal rate. In these cases the wheels have been built in segments, with surprising disregard of necessary strength in the flanges and bolts by which the segments were held together. The American Society of Mechanical Engineers will do a good thing, if it shall adopt 10 as a factor of safety in tensile strength, to be recommended by it for all mechanical work, and shall also recommend that in segmental wheels the joints be made, if anything, a little stronger than the section of rim. In applying the formula given above, it will be safe to take, as the value of R, one-half the outside diameter of the wheel. This being greater than the diameter measured on the center of gyration, the computed centrifugal force will be greater than that really exerted.

Again, an objection to very high speed is not found in a tendency to knock on the centers. In a properly designed and constructed engine, in which the valves are correctly set, and which is run by steam, high speed tends to silent running. Noise from bad design or bad work, from insufficient lead given to the valves, and from water in the cylinder, is excluded from consideration.

It is admitted, with pride, that the bad consequences of these defects are aggravated by high speed. This revelation of them has wrought an entire change in engine construction, not yet completed, and even makers of slower speed engines have largely profited by it. But it is obvious that there is now no excuse for their existence. The only legitimate cause of knock on the centers is loose boxes, and knock from this cause is softened as the speed is increased, and at extremely high speed will disappear entirely, owing to the force of the steam at these points being absorbed in overcoming the inertia of the reciprocating parts.

Again, vibration is not an objection to very high speed, because it is an easy matter so to design and construct an engine, and balance the running parts, that it shall be free from vibration at any speed whatever.

Again, very high speed is not objectionable, *per se*. If an engine runs in silence, completely free from vibration, without any tendency to warm, and without wear of any running part, its very speed renders it an object of especial admiration, even to those to whom such speed is new. Whenever extremely high speed in a steam engine has caused any other feeling in the beholder than that of admiration, it has always been the case that it has been attended with something annoying, a noise, or a jar, or some uncomfortable action, which ought not to have existed.



SIXTEEN INCH HOLLOW SPINDLE LATHE.

All this being true, there still remain two considerations of a controlling nature, which require that the rotative speed of engines shall be kept within moderate limits.

The first of these is, that engines ought not to be run as fast as they can be. It must, on reflection, be obvious to every one, that an engine should be capable of running, and that too with entire satisfaction, so far as its motion is concerned, a great deal faster than it *is* run. This is the solid ground of security and confidence. It means peace and comfort, and helps to make men sleep well o' nights. It means long life to both engine and builder. I do not know anything to which the ancient maxim, *in medio tutissimus ibis*, is more directly applicable. Observe the force of the superlative, *tutissimus*, considered as a positive statement, "in the middle course you shall go *most safely*." That is just what we want in mechanics, in all our progress, to go most safely.

The second objection to the employment of extremely high speed is a very serious one indeed. It is the large amount of waste room in the port, which is required for proper steam distribution. In the important respect of economy of steam, the high-speed engine has thus far proved a failure Large gain was looked for from high speed, because the loss by condensation on a given surface would be divided into a greater weight of steam, but this expectation has not been realized. Far from it. The performance of this class of engines shows, instead, a positive, and in some cases a large loss in economy. For this unsatisfactory result, we have to lay the blame chiefly on the excessive amount of waste room. It has been already pointed out by Mr. Harris Tabor, that the ordinary method of expressing the amount of waste room, in the percentage added by it to the total piston displacement, is a misleading one. It should be expressed as the percentage which it adds to the length of steam admission, and then every one would see what a serious thing it is. For example, if the steam is cut off at $\frac{1}{8}$ of the stroke, 8 per cent. added by the waste room to the total piston displacement means 40 per cent. added to the volume of steam admitted. Under these circumstances, it is obviously the duty, and for the interest, of builders of high speed engines to adopt every expedient for reducing the amount of waste room, that can be done consistently with the proper admission and discharge of the steam. For this, the first requisites are moderate piston speed and longer stroke.

Engines of 4, 5 and 6 feet stroke may properly be run at from 700 to 800 feet of piston travel per minute, but for ordinary sizes I would recommend and urge that 600 feet per minute be taken as the limit of piston travel, under all circumstances. This will give from 300 revolutions per minute with 12 inches stroke to 100 revolutions per minute with 36 inches stroke, with which purchasers ought to be satisfied. I would ask builders, in their own interest, to resist the temptation to get the utmost out of a given engine, and to set their faces like a flint against the demand for short-stroke engines, which shall occupy but little room, and from which the required power can be got by speeding up beyond the limit here proposed.

But I am met with the objection that, in this class of engines, large waste room is a necessity, to prevent break-down from water in the cylinder—that of the two alternatives, of waste of steam in this way, and broken cylinder-heads and pistons, purchasers prefer the former. I confess that I am thoroughly disgusted at the engineering which puts purchasers of engines in such a dilemma as this. Getting rid of water in the cylinder seems to be the prerequisite to any attempt to reduce the amount of waste room. Then, by all means, let it be the first object of builders of high-speed engines to get rid of all possibility of water in the cylinder, in an amount capable of doing any harm.

Sixteen-inch Hollow Spindle Lathe.

The lathe shown herewith swings 16 inches over bed, and 10 inches over carriage; the distance between centers is 42 inches less than length of bed; weight with 6-foot bed, 1,800 pounds.

The spindle has a hole through it $1\frac{5}{16}$ inches diameter, and is fitted for Morse taper No. 4. The front bearing is $2\frac{1}{16}$ inches diameter, and 5 inches long; tail spindle $1\frac{7}{8}$ inches diameter.

The lathe is geared 11 to 1; largest step on cone 10 inches, and width of belt $2\frac{3}{4}$ inches.

The carriage has power cross-feed, both feeds being controlled by one friction, the change from one feed to the other being made through the upper knob, at the right of the hand-wheel. The knob below this is used for reversing the direction of either feed. The countershaft has pulleys 10x3½ inches, friction pulleys, and runs in self-oiling boxes. This lathe is made by Fay & Scott, Dexter, Me.

Herr von Lupin, of Munich, calls attention to two liquids for use in thermometers which he considers possess valuable qualities. One is dilute sulphuric acid, the expansion of which is practically constant. Another is chloride of calcium in spirit, 10 to 15 per cent. of the anhydrous salt being recommended.

To the Foremen Blacksmiths of the United States.

Your committee appointed to ascertain the number of foremen blacksmiths favoring the establishment of a national organization for mutual benefit have received such a large number of favorable replies that we are decidedly of the opinion that we are justified in calling a meeting for that purpose, to be held at Chicago, on the 5th day of September, at 10 o'clock A. M., at 901 Rookery Building.

We hope to have a large attendance and respectfully solicit the hearty co-operation of our friends, the master mechanics, and other railroad officials, who have heretofore been alive to our interests, and who, so far as we have been able to communicate with them, have expressed themselves as favorably inclined to our laudable undertaking, and we feel confident that we can rely on their advice and assistance.

We cordially invite representatives from the mechanical press and iron and steel houses, who may be interested in our better education as to the manipulation of their products.

Hoping that those who are eligible will make strenuous efforts to be present with proper credentials, we remain

Very truly yours,

J. J. THORNTON,
C. H. WILLIAMS,
W. G. LOTIS,
GEO. F. HINKENS,
Committee.

A New Protractor.

The accompanying illustrations represent a new protractor patented by Mr. Oluf Tyberg, 1387 Bedford avenue, Brooklyn, N. Y. It is a very handy instrument for transferring angles, and can be used to great advantage in the drawing room, machine shop, pattern shop, or for any purpose requiring an accurate measurement, or transference of angles. Figs. 1 and 2 show different views of the instrument. The graduated arc remains fixed in a case provided for it. The hinged legs *E* and *F* lie in the same plane; the holes *h h* in the leg *E* fit accurately on corresponding pins in the straight bar of the arc, by which the leg *E* can always be set to zero point and held there while the leg *F* is set to any desired angle. The inner edges of the legs run to the vertex of the angle, which is advantageous in filing up templates of thin metal.

Figs. 3, 4 and 5 show details of the hinge, and Fig. 6 shows a section of the hinge through *x x* in Fig. 1, the whole showing the construction adopted for securing a comparatively tight and yet a smooth working joint. A short tube, *A*, is passed through the pieces *B* and *D*, and is then riveted over to secure sufficient friction for holding the legs to any angle. The piece *C* is simply a liner to bring the legs, which are screwed to the pieces *B* and *D*, into the same plane. Should the joint at any time work too loose, the hinge can be readily taken off, and the joint tightened by riveting the end of the tube *A*.

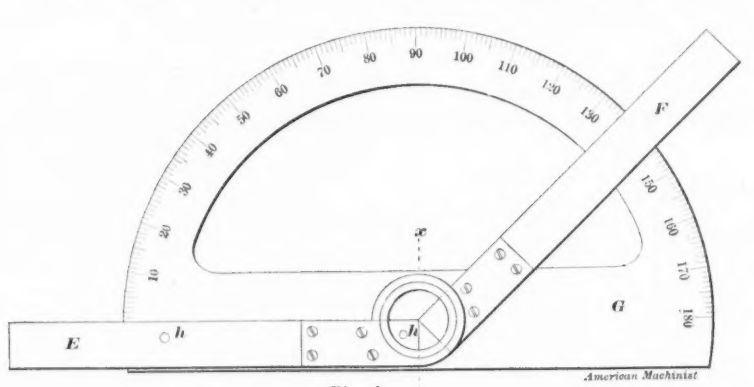


Fig. 1

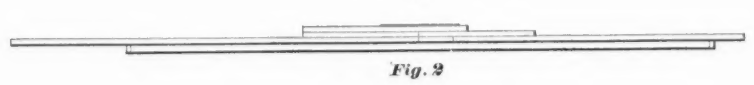


Fig. 2

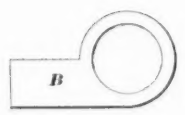


Fig. 3

Fig. 4

Fig. 5

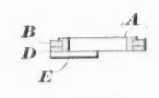


Fig. 6

A New Protractor.

New Feeder for the Gatling Gun.

Dr. Gatling, of revolving machine gun fame, has applied a feeder for the gun which is said to be an important addition. This feeder was developed and applied to the gun referred to as exhibited at Springfield, in the shops of the Dwight Slate Machine Co., of Hartford, Conn., the patents for it being in the name of two employes of that company. Of this feeder the *Hartford Times* says:

Dr. R. J. Gatling, whose revolving machine gun has attained a world-wide reputation, has applied a feeder for the gun, which renders it still more convenient and useful than ever. It seems to be a perfect machine gun now. On a strip of tin are placed twenty smokeless powder cartridges, each held in place by bits of the tin that are turned up for the purpose. These slips are put into a horizontal opening, and as they are drawn through, the cartridges are stripped off and placed in position to be thrust into the chambers. The motion is positive, and there is no failure in any part of the movement. The old plan was to drop the cartridges into a vertical opening and they were carried by gravity to their proper position. It will be seen that by this old method, the gun could not be used when pointed upward or downward, except to a moderate degree. But with the new invention the cartridges are held in place in whatever position the gun is held, horizontally or perpendicularly, or at any angle. Each one of the old feeders cost $2 50. The new tin strips cost but two cents each. The new system shields the cartridges from the rain.

There is another advantage: the strips, with cartridges attached, can be compactly packed, and a much larger amount of ammunition can be carried with the gun than by the old way. The gun can be fed by these strips with the greatest rapidity. With them it has been fired 3,120 times in a minute; and when turned by a little electric motor attached to the breech, it can be fired 5,000 times a minute.

The ingeniously contrived movement of this revolving gun works as easily and smoothly as the simple rolling of a wheel. It is a wonderful piece of mechanism, wonderful for its simplicity and accurate movements—superior to all other machine guns in its principle of revolving cylinder and revolving barrels and locks at the same time—moving with such exactness that in firing over 3,000 charges in a minute, there is no accident, no failure in the working of the cartridges. If a cartridge is imperfect (something that does not occur once in 10,000 shots), the gun works on just as accurately as if the missfire had not occurred.

The small bullets used in this gun, with smokeless powder, have been fired through forty one-inch pine boards. They can be fired two miles, and then have force enough to pass through the body of a man. Dr. Gatling recently exhibited one of his newly perfected guns before the United States army board of examiners at Springfield, and they were delighted with it. Eighteen of the new guns were ordered by the war department, each having this remarkably advantageous improvement in the feeding.

Mark Your Steel.

Where different grades of steel are kept together in one rack, it sometimes happens by mistake that a very fine tool is made of common steel, while a tool for common work is made from an expensive grade. A simple way to avoid this is suggested by one of our friends. It is to paint each bar with a distinctive color when it is received; not the whole bar but just a streak on one side, near the center, a foot or two long. For example: Crescent, white; Crescent Extra, red; Crescent Special, blue; Common, green. Let the smith cut from both ends of the bar and he will never be at a loss as to the grade of any short piece he may have on hand.

The grade or quality is, however, stamped in the middle of each bar.—*Sparks from the Crescent Anvil.*

LETTERS FROM PRACTICAL MEN.

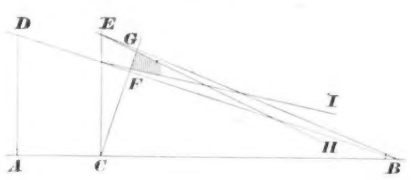
Cutting Screws.

Editor American Machinist:

In my second letter I spoke of the use of cold rolled shafting for lead-screws, but there is one peculiarity about it that makes a poor article of it for screws that require to be at all accurate. I believe it is next to impossible to make an accurate screw of it. Take for instance a piece of 1¾″ cold-rolled shafting of the best grade, 6 feet or more in length, and cut a thread of ½″ lead, ¼″ deep, and 5 feet long; measure the length of the piece accurately before cutting the thread, and again after the thread is cut, and you will find the piece to be about $\frac{1}{16}$″ shorter after the thread is cut than it was before. Suppose you are cutting a lead screw whose threads are of the usual shape, that is, the sides of the thread are at an angle of 20 degrees to each other; observe the action of the tool as the thread is nearly finished. Set the tool at the center of the length of the thread, so that it will cut an equal amount from each side, then (if the thread is right-hand) run the carriage down to the tail-stock end and start a light cut. You will observe that the tool cuts all or nearly all on the right hand side, but as it approaches the center where it was set, it cuts nearly equal on each side, and as it nears the head-stock it cuts more and more on the left-hand side. Not only will it do this a few times, but the same thing can be observed all through the cutting from start to finish. In fact, the screw will shorten with every cut taken. The reason for this shortening lies in the fact of the shaft being rolled cold, making the outside of closer grain, and stretching the center lengthwise, and as the outside is cut through it allows the center to contract and draw the outside with it.

Now take a piece of machine steel, turn it, and cut a thread the same as the cold rolled, and you will not detect any difference in the length of the piece before and after cutting the thread by ordinary methods of measuring.

The following method of finding the correct angles for grinding worm and thread



tools will give accurate results and save lots of valuable time cutting and trying or "monkeying."

On the base line lay off the distance *A B* equal to the circumference of the screw at the outside diameter, and *C B* equal to the circumference of the core of the screw, or the circumference at bottom of thread. At *A* and *C* erect perpendiculars *A D* and *C E* equal to the lead of the screw. Draw the lines *D B* and *E B*. Then the angle *D B A* will equal the angle of the thread at the outside diameter, and the angle *E B C* will equal the angle of the thread at the bottom diameter. Draw the line *C G* at an angle from *C E* equal to one-half the sum of the angles *D B A* and *E B C*; this gives the angle of the top face of the tool from a horizontal. Draw the lines *F I* and *G H* at angles of 5 degrees from *D B* and *E B*; this gives the side clearance of the tool from the thread. In case of a very steep thread it will be necessary to give more than 5 degrees clearance to the following side of the tool, as by its construction the following side must be above the center of the screw, thus reducing its clearance, while the leading side will be below the center, which has an opposite effect. When the tool is properly set, the center of the end of the tool will be at the same height as the lathe center. The shaded portion of the diagram shows the *form* of a section of this tool; the bottom of the tool is parallel to the line *E C*. I have cut four-threaded screws with these tools whose lead was nearly equal to twice the diameter of the screw. The diagram shown is for a tool for a four-threaded screw whose lead is equal to its diameter.

C. W. Wright.

Some Old Nails.

Editor American Machinist:

I send you with this some nails taken from an old house about seventy years old. One of them you will notice has a weld in it, and one I have bent in the shape you see without heating. Will any of the nails made to day stand such a test? These nails are hand-made, and probably from imported iron. They were taken at random from a lot. H. G. Avery.

[The specimens sent by our correspondent are of old-time hand-wrought nails. One of them, originally about 3½ inches long, is bent quite back on itself twice in its length without any evidence of stress in the bends. We think he will not find many such nails in the market, but have no doubt they could be had if the demand for them was sufficiently large. They show that good iron was made three-quarters of a century ago.—Ed. A. M.].

Brass Pipes.

Editor American Machinist:

Mr. P. H. Bullock gives an account of a brass pipe cracking, an experience that has been repeated many times.

Brass is an alloy of copper and zinc, and it is not usual that the metals are thoroughly mixed in the crucible, and when they come to be rolled the parts having the most zinc will be the hardest, and there will be quite a strain on the metal at that point. It is not necessary to put pressure on it, as laying it out in the sun will crack it in the same way.

If the pipe, after the threads are cut, is slightly annealed it will remove the strain and generally prevent fracture. They can be annealed before the threads are cut, but if too much anneal is given them they will twist. They are not so reliable as copper pipes, for the reason that the latter is a solid metal of equal tenacity and equal specific heat.

The writer has been very busy this summer, but hopes that this will not make any difference with Mr. W. H. Booth, and that he will continue to favor us with his excellent letters. W. E. Crane.

Printed Letters on Tracing Cloth—Photolithographic Copies of Drawing.

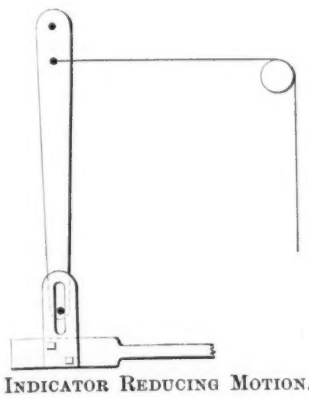
Editor American Machinist:

I notice several communications regarding the use of substances to cause India ink to flow upon tracing cloth, and as I had some experience many years ago, I add my mite. Before the Patent Office adopted the use of photolithography, duplicate drawings on tracing cloth were required. I thought one day it would be neat to have titles, etc., printed on instead of being produced by the pen. I tried it, and I really believe those titles are not dry yet. Shortly after the Patent Office adopted the use of photolithography. I had a line of foreign patents to procure on a machine which was somewhat complicated, and remembering my experience with printed headings, I consulted my friend Norris Peters about lithographic printing on tracing cloth, and he said there would be no trouble about it. I therefore had the drawings made on a large scale and reduced by the camera, but the lithographic ink on tracing cloth did not dry any better than the printer's ink. I got along with it, however, by substituting paper for my foreign applications.

One day my draftsman announced that a friend of his had found out how to make the printing ink dry on tracing cloth, and would treat prints for 25 cents per sheet. I gave the matter a trial; it was entirely successful, and I afterwards paid the quarter for a good many sheets. After a time my draftsman told me he had purchased the secret, and he presumed I would not object to his earning the quarter. This was satisfactory, of course. A little while after that a friend of mine, doing business in a distant city, was looking for an assistant, who, if satisfactory, could be taken as partner, and I so strongly recommended my young friend and draftsman, that he was engaged, and left me. Before going he said he would like to present me with the secret, and thereupon he gave me a little tin can of powdered soapstone which he had purchased for 25 cents at a neighboring shoe store, and told me to dust a little of that over each sheet, and wipe it off with a rag or any-

thing. That little can of French chalk I still have. It has furnished the dryer for many and many a sheet, and contains enough yet to last out my lifetime.

I do not know how general the practice may be, but I have resorted to it many



INDICATOR REDUCING MOTION.

times within the fifteen years in cases where duplicate drawings were wanted, as for foreign patents. I make the originals two or more times the desired size, linear, making the lines proportionately heavy, and then have the duplicates produced by photolithography. The large size enables the draftsman to work out small details clearly, while the reduction hides small imperfections of workmanship. The photolithographer will make the duplicate on any material desired — parchment, tracing cloth, bristol board, drawing paper or thin paper.

R. D. O. SMITH.

Indicator Reducing Motion.

Editor American Machinist:

Mr. Fred W. Salmon, in your July 20th issue, gives a sketch of a reducing motion for steam engines, and says: "It gives a motion approximately correct to the paper drum." By an examination of the sketch it will be seen that by having the slot in the lever the length of the latter is variable. To make such a motion more correct, the slot should be in the arm, secured to the crosshead, or any part moving coincident to the latter, and the pin secured to the swinging lever, thus giving a permanent length of same as per inclosed sketch.

This is one of the most simple ways of reducing the motion. W. BARNET LE VAN.

Allowance for Finishing.

Editor American Machinist:

The criticism of Harry M., in the issue of July 27, would be well taken, if the amount for finish was arbitrary, but, as all machinists know, the amount left for finish is governed by the piece being worked. I am afraid he would meet up with trouble with his foreman if he resorted to the $\frac{1}{125}$ inch for finish on a flywheel section, or an engine bed, or other heavy piece, and likewise he would have the same experience if he tried to finish with $\frac{1}{16}$ inch on a rod, or piece of brass work, or on thin pieces. The matter is one of judgment, and applies both generally and particularly to the work in hand. As to roughing both sides before finishing either one, that is common practice, where the work demands it, but is unnecessary except as the judgment is that it is unsafe to do otherwise. A large piece may be roughed, and finished at one setting and not be sprung, especially as it is generally the custom to slack the bolts some on the finishing cut. A light piece is or should be roughed on both sides, and then finished. There was intended no arbitrary rule for finish, whether $\frac{1}{16}$ inch or $\frac{1}{125}$ inch, as every piece will call for different execution in the matter, but the $\frac{1}{16}$ inch mentioned was explanatory only of the use of the tool. Tools only have a secondary place in the production of work, and the makers of tools of greatest precision do not guarantee that work will be true in the hands of men who lack judgment in their use. The idea thrown out by "Harry M." is full of thought, and the allowance for finish is a matter that interests nearly every machinist, as in that fact lays the question of possibly one more cut, some more time, and gain or loss, in the matter of profit.

C. A. BURTON.

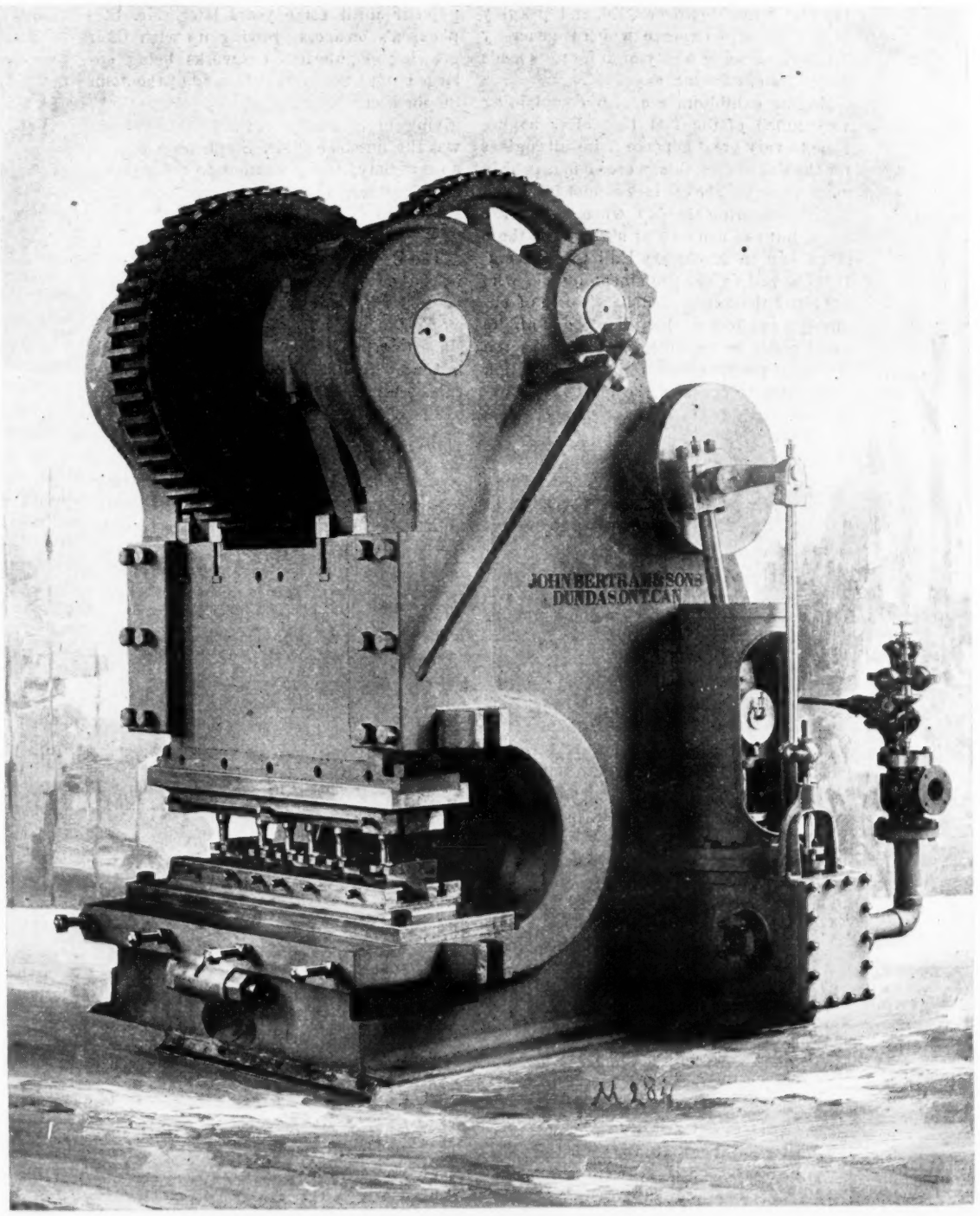
Speed Variation.

Editor American Machinist:

In answer to "M. E." regarding my letter on "An Error in Speed Variation," I would say that I was surely wrong when I said "The per cent. variation would be $(183\ 22)^2 - 1$." This should have been, "The variation would be $(1.8322)^2 - 1$," giving .91 or 91 per cent. This is virtually the same as the method now used by "M. E.," since dividing a quantity by its reciprocal is equivalent to squaring the quantity.

I should have corrected this obvious slip of misplacing the decimal point had it not been for the illustration which followed, and which I thought would set right any person who might be temporarily led astray by the error.

"M. E." seems to understand my previous note as a defense for the Gordon variable speed arrangement. I had, however, no such intention and wished merely to call attention to the error in his ("M. E.'s") method of determining the per cent. of variation when two pulleys are used. E. J. F.



COMBINED FISH PLATE PUNCH AND SHEAR.

Combined Fish Plate Punch and Shear.

The illustration herewith represents a combined fish plate punch and shear. The housings are cast solid being 10″ thick at the front and extending back 78″; they are cast separately, planed and bolted together with 3″ bolts. The housings extend below the foundation like an arch to give solidity to the gap.

The machine is steam driven by an attached engine with cylinder 14″x14″ and regulating governor. The power is communicated from the engine shaft to the ram by a set of heavy multiple gearing, the last of the series being $9\frac{1}{2}$″ face and $3\frac{1}{2}$″ pitch, the wheel and pinion being shrouded to the pitch lines.

The eccentric shaft is a hammered steel forging 20″ diameter at the wheel bearing; the eccentrics are forged solid on the shaft and have a diameter of 15″ with 5″ stroke. The two connecting toggles are socketed in top of ram slide with a bearing 6″ diameter and 10″ long, and are held in place by steel straps. On the bottom of slide the shear or punch blocks are bolted as required.

The shear blades are 57″ long and $1\frac{1}{2}$″ thick and will shear 1″ plate. The punch blocks are steel and planed for the reception of punches and dies at any point. The machine will punch 6 holes $1\frac{1}{2}$″x$\frac{7}{8}$″ at one stroke, the number of strokes being 12 per minute. The ram can be stopped by a lever and steel-faced clutch on the intermediate shaft. The intermediate shaft is steel 8″ diameter and the engine shaft is 6″, steel. The machine will shear scrap plate 18″ wide and crop same any length, as there is a clear opening throughout between the housings.

The weight is 66,000 pounds; speed of engine 150 revolutions per minute.

The machine is manufactured by John Bertram & Sons, Dundas, Ont., Canada.

The Chicago Meeting of the American Society of Mechanical Engineers.

According to the programme which had been previously announced in these columns the deferred spring meeting of the A. S. M. E. convened in the Palace of Arts, Chicago, as part of the International Engineering Congress. The Eastern members of the A. S. M. E. with their friends had reached the city by a special train under the management of Raymond & Whitcomb, a special car having been run through from Boston for the accommodation of those residing in that vicinity, and attached to the train at New York, the party numbering about sixty on arrival at Chicago, Saturday, 29th.

Monday, 31st, at 10 A. M., the Engineering Congress was formally opened, about 400 being in attendance in the hall, among whom were many of the most illustrious engineers of this and other countries; nearly every country in which important engineering work is done being represented.

President Bonney, of World's Congress Auxiliary, made the opening address, and he was followed by O. Chanute, C. E., who acted for E. L. Corthell, C. E., the chairman of the general committee of the Associated Engineering Societies, who was unavoidably absent in Mexico. After a short address of welcome Mr. Chanute introduced the representatives of the various engineering societies at home and abroad, each responding briefly on behalf of those he represented. Sir Benjamin Baker, builder of the Forth Bridge, responded for England, and among other things said that he bore the fraternal greeting of the oldest engineering society in the world; organized in London by John Smeaton about the time of our "Boston tea party," the charter members of this society, to the number of about forty, having, almost without exception, made an enduring fame for themselves in the engineering world. Baron Q. de Rochemont, of Paris, responded for France; C. O. Gleim for Germany; Hugo Koestler, chief engineer of the State railways of Austria, for that country; Alfred Nyberg for Russia; Chevalier Celso Capacci for Italy; after which were responses from William Metcalf, C. E., of Pittsburgh, president Civil Engineers; Eckly B. Coxe, of Drifton, Pa., president A. S. M. E.; Henry M. Howe, president Mining Engineers; Professor Ira O. Baker, of the University of Illinois, for the Educational Engineers; Major H. S. Harris for the Military Engineers, and Commodore George W. Melville for the Naval Engineers.

The representative of Germany gave some account of the various engineer societies which he represented; said that the idea of an international association of engineering societies had gained considerable headway in his country as the result of an impetus from America, and that it was now proposed in Germany to form such an association, to be permanent and to hold meetings

(*Continued on page 9.*)

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NEW YORK, AUGUST 10, 1893.

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Headquarters at the Fair.

During the continuance of the Chicago Exposition the American Machinist will have its headquarters in the space allotted to the Mechanical Press in Machinery Hall. The exact location is Section No. 27, Column K 37. Word can be left with the attendant there by any one who is desirous of meeting a representative of this paper, who may at the time be engaged elsewhere on the grounds.

Running and Testing Engines at Chicago.

Last week we intimated that there was the possibility of objections to proposed tests of engines at Chicago.

At this writing the prospect for such tests does not seem to be very bright, the engine builders that seem anxious to go into the matter and bear their portion of the expense of conducting the tests being few in number. While there may be various reasons for this, it is perhaps true that the expense of making the tests in the manner proposed has some effect in discouraging the enterprise, one builder desirous of going into the matter having been informed that the test of one of his engines would probably cost something over $600, and possibly $1,000, a rate of expense which is generally regarded as being pretty high for tests made under the circumstances.

Engine exhibitors are also complaining very much of the fact that after having gone to very great expense to install engines for the exhibition, things are so managed in most cases that the engines cannot be shown in motion during the day when visitors are there, but can run only at night when there is no one in Machinery Hall to see them. It is claimed by one prominent builder who has many thousands of dollars worth of engines on exhibition, that this state of affairs could easily be remedied, if there was the proper disposition shown by the Exposition authorities to consider the interests of exhibitors, and recognize the fact that builders who have gone to the trouble and expense of building engines and installing engines with the understanding that they were to be shown in working operation, should in justice and fairness be allowed to so exhibit them.

A running engine in an exhibition means much more to both visitors and exhibitors than an engine standing still, and engine builders who see the crowds pass by their standing machines to give attention to those in operation, while they are allowed to move theirs only at night, can scarcely be blamed for finding fault with the arrangement. As we understand the matter, it was the understanding in the first place that there were to be no dead engine exhibits in the Exposition. Every engine exhibited should be in motion and doing work. This being the case, the builders naturally made their arrangements accordingly, expecting the public to see their machines working. If it had been understood in the first place that no one was to see them except standing still, a different arrangement, and one probably involving less expense, would have been preferred.

Last week we published a letter from a correspondent, Mr. Newton, in which he criticised a short item in which we referred to the advance in the price of coal. Mr. Newton thought what we said was in "very bad taste," and we were willing he should say so. We supposed—and still think—that it was pretty generally believed that the Reading road, or combination, came to grief through gross mismanagement in various ways, but notably in the matter of trying to "own the earth," or at least an undue amount of that part of it that is composed partly of coal, not for the purpose of bringing the coal to the surface but that others should not do so. This and a covetous desire to control too many railroads is, along with other items of mismanagement, popularly believed, we think, to have brought the affairs of the Reading to a condition where several advances of twenty-five cents a ton on coal would have been required to save it instead of one advance being sufficient, as our correspondent seems, as he has an undoubted right, to think. To put it another way, in its effort to make coal consumers pay whatever price it thought fit to extort the Reading combine, to use a homely expression, "bit off more than it could chaw," and went pretty badly to pieces in the operation, for which coal users and most others feel little grief. We should not, having given our correspondent an opportunity to express his views, have referred to the matter again except that we have had our attention called to his statement. With this we shall leave it.

John Stephenson.

The name of John Stephenson, who died at his home in New Rochelle, July 31, was known to the country and the world as the pioneer street car builder. He was born in Armagh, Ireland, on July 4, 1809, and came with his parents to New York two years later.

He was apprenticed to a coachmaker at the age of 17. In 1832 he secured a patent for a street car, being at that time in business for himself. Street cars did not become popular until some years later, Mr. Stephenson's business growing up with their growing popularity, the works being enlarged until the present factory of the John Stephenson Car Company, in New York, giving employment to several hundred men, was the outcome. Mr. Stephenson sought no notoriety, being content to manage his large business, in which he was eminently successful.

The Broadway cable road (in New York) is, if the explanations of the officials are to be taken as strictly true, an "awful example" of the folly of undue haste. Ever since the starting of the cars on this line breakdowns and blockades have been the rule. As an excuse for this condition of affairs, the officials say they gave heed to public clamor and started the cars running before everything was in readiness. If they paid attention to public clamor for starting—which clamor we do not think was very noticeable—to the extent of beginning operations before matters were in readiness, it was not only an act of foolishness, but a remarkable case of doing what such corporations are seldom accused of, namely, paying attention to the wishes of the public against their own interests, or when it is not directly for their interests. The matter is much more easily explained, and there are reasons for believing correctly, by assuming that several mistakes were made in constructive details. It is not sensible, however, to assume, as some do, that any mistakes that have been made will not be corrected. Cable roads are very successfully operated elsewhere, and, of course, can be on Broadway. It is entirely in the interest of the company that everything shall work smoothly, so it may be set down as rather certain that that will be the final outcome.

Educational.

In sending us a catalogue of Case School of Applied Science, of Cleveland, Ohio, a correspondent writes as follows. We are sure he will excuse our publishing what he writes, as we suppress his name, and use what he says in hopes it will be of help to some young man looking for opportunities.

I have seen in the American Machinist a great number of questions as to schools that teach trades, and also asking how best to get an education.

I judge a large number of these questions are asked by young men in shops, or those that are at least not rich. Knowing from experience just how hard it is for such to educate themselves, I write you this telling how things are done here. You will see by the catalogue I send under another cover, that the tuition is small, the total expense for tuition, stock, and breakages being slightly over $100. Now there has, so far, been a chance for students that were good workmen, either in wood or iron, to work all the above amount out, and still keep right along with their studies. A number do janitor work, others fire the boilers and run the engine. These are men that cannot afford to pay money.

I write this, not to be published, but that you may understand just what is being done here to help young men to get an education.

Any one writing to the school, inclosing a stamp, can get all questions answered, also get catalogues, etc.

The Fourteenth Annual Report of the Wells Memorial Institute for Workingmen, of Boston, Mass., contains a summary of the work done during the past year, and an appeal to its friends for help. This institute is doing a work peculiar to itself in the way of providing educational facilities, lectures, co-operative association, social privileges, etc., etc. It is pleasing to know that there was a large increase in its membership last year. We have no doubt it will receive the financial aid it appears so well to deserve.

Massachusetts Institute of Technology, of Boston, Mass., has issued an illustrated pamphlet embracing a brief account of its foundation, character and equipment. Half-tone cuts of buildings, rooms and equipments add to the interest of the work.

Vanderbilt University, Nashville, Tenn., in its annual announcement, engineering department, includes this year for the first time a regular course in electrical engineering.

Director-General Davis, of the World's Fair, is reported in a speech at Chicago as complaining of the small consideration the railroads were according the Fair. We took occasion some months since to express the opinion that railroad managers would operate their roads this year just as they did any other year, viz., to make money. We do not see how, in justice to stockholders, they can do otherwise. It would be a good thing, in some respects, if railroads transported people at considerable loss to and from Chicago during the continuance of the Fair, but it would not be business, and railroad owners do not pay managers to dispense charity. The Fair management can rest fairly well assured that the railroads will accord considerations to the Fair just so far as it can be made clear that it is good business management to do so, and no farther.

Questions and Answers.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(390) A. M. D., Lancaster, Pa., writes: I have a book treating on mechanical matters, and in describing a method of hardening and tempering steel, the author explains the manner of hardening the taps, and then says, "Temper them by the cold test." Please explain to me what is meant by the term "cold test"; I have never heard of it before. *A.*—We are not familiar with the term, but presume it means a test made with a file. By reading the book carefully you will probably find the term explained by the author.

(391) C. A., Brooklyn, N. Y., writes: Please give me the mixture of a composition metal or alloy for thin open-work castings. They are to be used for ornamental work of 9 inches square and $\frac{1}{16}$ to $\frac{1}{8}$ inch thick. The alloy should be pretty hard, so that it can be easily silver-plated, but it should not be too brittle. It should flow easily into brass molds, and should not require too high a temperature for melting, and should not

cost more than 8 cents a pound. *A.*—Four parts of lead and two parts of antimony by weight may answer your purpose.

(392) J. H., Bridgeport, Conn., writes: A horizontal pipe a mile long is connected to a boiler carrying 200 pounds of steam pressure. The pipe is closed at the other end, and a gauge placed at the boiler end and another at the further end of the pipe. Would there be any difference in the pressure indicated by the two gauges? Condensation is not to be considered. *A.*—There will be no difference in the pressures indicated. 2. Could there be any friction in the pipe without an opening? *A.*—No. There can be no friction without a flow of steam. 3. Would there be any difference in the pressures if the pipe is placed vertically? *A.*—Yes; the gauge at the bottom of the pipe will show a greater pressure; the difference being equal to the weight of steam.

(393) C. A. C., Denver, Colo., writes: I have a three horse-power locomotive boiler made of $\frac{3}{16}$-inch steel capable of carrying a pressure of 100 pounds. I want to put on two cylinders of one horse-power each. What should be the size of cylinders, size of driving wheels, size of axle journals? And what should be the weight on the drivers to utilize the power of the cylinders? *A.*—Cylinders, 2 inches diameter by $2\frac{1}{2}$ inches stroke; driving wheels, 10 inches diameter; driving wheel axle journals, $\frac{3}{4}$ inch diameter, $1\frac{1}{4}$ inches long. Weight on driving wheels, 420 pounds. 2. Please give me the address of some firms who will furnish me with the castings that I may need. *A.*—We do not know who would be willing to furnish you with the castings. It seems to us that you will have to make your own castings to suit your design of engine.

(394) J. H., Brooklyn, N. Y., writes: Kindly inform me which is a good book treating on algebra suitable for a machinist who knows nothing about it. *A.*—There are a good many good books treating on this subject; we will mention a few of them, but from this it must not be inferred that these are the only good ones; we mention them simply because we have used them and are familiar with them. "Complete Algebra," by E. Olney; "Elements of Algebra," by G. A. Wentworth; "University Algebra," by C. Davies; "Treatise on Algebra," by E. Loomis, and "Davies' New Bourdon." The first two are of a more elementary character than those that follow; but you will probably not find much difficulty in studying any of them. It may be more advantageous to you to use the same algebra as is used in the public schools in your city; by so doing you may obtain some assistance by acquaintances who have studied in the public schools.

(395) C. G. S., Columbus, Ga., writes: Please inform me how to do nickel-plating without the use of a battery. I have some gasoline irons to nickel. *A.*—Into the plating vessel, which may be of porcelain, but preferably of copper, is placed a concentrated solution of chloride of zinc, which is then diluted with from 1 to 2 volumes of water and heated to boiling. If any precipitate separates it is to be redissolved by adding a few drops of hydrochloric acid. As much powdered zinc as can be taken on the point of a knife is thrown in, by which the vessel becomes covered internally with a coating of zinc. The nickel salt, for which purpose either the chloride or sulphate may be used, is then added until the liquid is distinctly green, and the articles to be plated, previously thoroughly cleaned, are introduced, together with some zinc fragments. The boiling is continued for 15 minutes, when the coating of nickel is completed and the process is finished. The articles must be well washed with water and cleaned with chalk. If a thicker coating be desired the operation may be repeated.

(396) J. A. F., Lapeer, Mich., writes: Please inform me of a method for putting on a coat of tin upon steel or brass by dipping it in the melted metal. About sixteen years ago I saw a man put on a coat of tin by dipping the article in two different solutions and then dipping it in melted tin, after which the article was placed in a chill, and it would come out as if it had been plated with burnished silver. *A.*—There are several ways of tinning steel or brass articles, and some will require different treatment to others. If, therefore, you have much of this kind of work to do it will pay you to engage some one who has had experience in this line of work. We do not know to what method you refer, but following may answer your purpose: For brass articles make a saturated solution of oxide of tin (tin putty) in potash lye; add to the solution some tin filings or shavings; make it as hot as possible, then introduce the brass or copper and it will be tinned in a few seconds. Iron or steel articles are put in a bath of one ounce cream of tartar, one ounce tin salt and ten quarts of water. The bath should be kept at a temperature of 190 degrees Fahr. in a stoneware vessel. Put pieces of zinc between the articles. Of course all articles must be thoroughly cleaned before immersion.

(397) E. A. M., Hartford, Conn., writes: To settle a controversy I would be pleased if you would answer the following: If two vessels of the same size be partially filled with water, one being filled one-half and the other one-quarter full and subjected to the same degree of heat, would the pressure be the same in both cases? If so, why? *A.*—If the temperature is the same in both vessels, and if the water is not wholly evaporated in either vessel, the pressure in one vessel will be equal to the pressure in the other. The pressure of steam always depends on its temperature and not on the amount of water in the vessel. If, for instance, the temperature is 70 degrees Fahrenheit in both vessels, the pressure in each will be 0.36 of a pound per square inch; if the temperature is raised to 212 degrees in both vessels then the pressure will be 14.7 pounds per square in each vessel; or if the temperature is raised to 220 degrees the pressure will be 17.2 pounds. In general, if heat be gradually applied to raise the temperature more vapor will form, but the pressure will not rise above a fixed value for each temperature, independent of the volume of water in the vessel; but when the water is all evaporated in one vessel, and some left in the other, and the temperature then increased in both vessels, the above will not hold true.

(398) P. J., Cleveland, Ohio, writes: We have a truck supporting a drum for hoisting a weight of 1,000 pounds. The drum is 2 inches in diameter, on its shaft is a spur wheel 4 inches diameter which engages with a pinion 1 inch in diameter; on the pinion shaft is a rope sheave 6 inches diameter. What tension will be required in this rope to raise the weight? *A.*—Neglecting friction, 83.3 pounds. 2. Will there be sufficient friction between the rails and wheels to propel the truck, friction cones being used for the purpose? *A.*—Yes. 3. What tension would be required on a line running from the truck to the end of track to move the truck at the same time that the weight is being raised? *A.*—That depends on the size of truck wheel, size of bearings, condition of bearings and rails. The tension in this line will be about 8 pounds for every ton of pressure between the wheels and rails. Here we have assumed that this line has nothing to do with hoisting the weight; that the weight is hoisted by the rope around the rope sheave, and that the force applied to this rope acts downward in a vertical direction. 4. Will the truck move in either direction while the weight is being raised? *A.*—Under the assumed conditions as stated above, yes. The whole arrangement seems to be very light for raising 1,000 pounds; be careful that you do not have a general break down.

(399) J. M., Yankton, S. D., writes: The water system of this city is supplied by two artesian wells. One of them, a 6 inch one, is located close to the reservoir and flows directly into it, and has supplied the city alone until quite recently. The reservoir is 130 feet above the principal part of the city. The other well is an 8-inch one situated higher than the city, but about 50 feet lower than the reservoir. It is claimed that both wells are in the same water bearing rock, and that both have the same pressure, allowance being made for the difference in elevation. In some tests we have made we find that having the reservoir full, the 6 inch well will keep it full alone, but shut off the 6 inch one and turn on the 8 inch one the water will run down until the reservoir is about half full, and there it will stay. What is the trouble? The 8-inch well is about half a mile from the reservoir, and is connected directly to the mains. Some, who claim to know, say that it is harder to keep the reservoir full on account of the water having to pass through the mains and supply the city first before it reaches the reservoir, while I think very differently. The reservoir being full and the 8-inch well turned on, all it will have to do is to keep it full, and if it has the same pressure as the 6-inch one it will do it, as it is nearly double the capacity. Who is right? *A.*—Whether the 8 inch well can keep the reservoir full or not, will depend on the amount of water taken from it before it reaches the reservoir. Another important item all of you seem to have overlooked is that the water from the 8-inch well has to flow through pipes about 2,000 feet in length, while the water from the 6-inch well has to flow through a comparatively short distance. The loss by friction is considerable, and, all things considered, no one should be surprised at the comparatively small quantity of water delivered into the reservoir by the 8-inch well. We believe all your trouble is imaginary.

(400) G. G., Rankin, Pa., asks: If a force of 10 tons is traveling at a rate of 100 feet per minute, will it continue to move at the same rate of speed when it is made to lift a load of 5 tons at the rate of 200 feet per minute? Or will it come to rest on account of the force and resistance being equal? I cannot understand how two equal and opposing forces can keep in motion, and if I mistake not, this is the very thing all engines are doing which are fully loaded. Take, for instance, a lever with a fulcrum at its center, and with a load of 100 pounds at each end; this lever will never move unless some outside force acts on it. Please clear away the clouds of this problem. *A.*—When a force acts upon a body, a secondary force, or a force of reaction, is at once set up, equal and opposite in direction to the primary force; these forces are said to be in equilibrium, and they neutralize each other's effects. Consequently such a set of forces cannot change the state of a body with respect to rest or motion; if the body is at rest it will remain so, or if in motion its motion will remain unchanged, so far as these forces are concerned. This agrees with Newton's first law of motion, namely: Every body continues in a state of rest or of uniform motion in a straight line until compelled by impressed forces to change that state. In a steam engine the pressure of the steam has to overcome certain resistances, and when the engine is running at a uniform rate of speed, the force exerted by the steam is equal to the force of the resistances, and since the engine cannot of itself change its motion, it must continue to move at a uniform rate of speed. The same holds true for the problem of the lever cited by you. Here we have three forces acting on the lever, namely, the loads at the ends and the reaction of the fulcrum, and these three forces are in equilibrium, and if the lever is at rest it will remain so until some other force acts upon it to change this state of rest. In your first problem the work performed by the force of 10 tons in lifting the weight of 5 tons is equal to the resistance of this weight into the distance through which this resistance is overcome, consequently the system is in equilibrium, and when the force has attained a velocity of 100 feet per minute in lifting the weight and then moves at a uniform rate, it will continue to do so unless some other force comes into play to change this state.

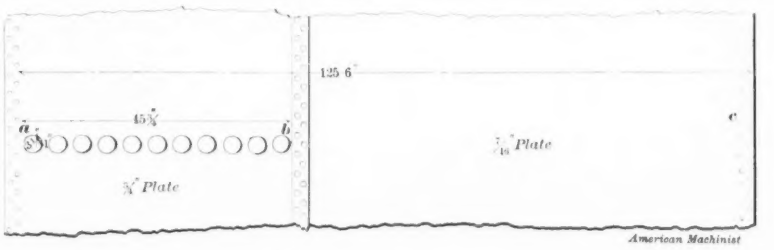
(401) E. E. B., Woonsocket, R. I., writes: The accompanying sketch represents the development of a drum 40 inches diameter. The left end or tube plate is $\frac{3}{4}$ inch thick; it has 11 tube holes cut in a row as shown; they are $3\frac{1}{4}$ inches in diameter. The plate on the right-hand end is $\frac{7}{16}$ inch thick; both plates are of steel. What is the safe working pressure of the $\frac{3}{4}$-inch plate from *a* to *b*; also, what is the safe working pressure of the $\frac{7}{16}$ inch plate from *b* to *c*; the factor of safety is to be 6? *A.*—The strength of the plates in the direction indicated will depend on the riveted joints; and these again will depend on the proper spacing of rivets and the workmanship. Assuming that the rivets have the correct pitch for the thinner plate, and that the rivet holes are punched, and the plates not annealed, these joints can resist 63 per cent. of the pressure which the solid plates can resist. We may assume that the ultimate tensile strength of steel plates is 65,000 pounds per square inch, hence the ultimate strength of the riveted joint is,

$$\frac{63 \times 65{,}000}{100} = 40{,}950 \text{ pounds per square inch.}$$

Adopting a factor of safety of 6, then the stress per square inch of metal in the joint must not exceed $\frac{40{,}950}{6} = 6{,}825$ pounds. The safe steam pressure in the drum is found by the following formula:

$$\text{Pressure} = \frac{\text{Thickness of sheet in inches} \times 6{,}825}{\text{Radius of drum in inches.}}$$

Since the safe pressure will depend on the thinner sheet we have safe pressure $= \frac{\frac{7}{16} \times 6{,}825}{20} = 149.29$ pounds per square inch. This pressure is lower than is usually allowed for a drum 40 inches diameter with sheets $\frac{7}{16}$ inch thick, but this is due to the high factor of safety which you have requested us to take. We believe that this drum, with correctly designed riveted joints, can safely resist a pressure of 230 pounds per square inch. The strength of the $\frac{3}{4}$-inch plate depends on the rivets in the joint, and since these are supposed to be correct for the $\frac{7}{16}$ inch sheet, the thicker sheet will add nothing to the strength of the dome. But the tube holes in the latter sheet will reduce its strength greatly in the direction of the axis of the drum, and therefore great care should be taken to reinforce the strength in this direction, otherwise serious results may follow. 2. Will the drum be strengthened by expanding a tube or thimble in each hole? *A.*—No.



BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Grant's gears, Lex'n, Mass., & Phila., Pa. See p. 12.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

Forming Lathes Mer. Mach. Tool Co., Meriden, Ct.

Milling Machs. Kempsmith M. T. Co., Mil., Wis.

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Drill Presses, with Tapping Attachments.
Gould & Eberhardt, Newark, N. J.

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Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

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For Cypress Tanks and Vats, address W. E. Caldwell Co., Floyd and Main Streets, Louisville, Ky.

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Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

"Shapers (Double Triple Quick Stroke")
Trade Mark.
Gould & Eberhardt, Newark, N. J.

Gear and Rack Cutting, Drawings for Bevel & Miter Gears, Cutters for Spur & Bevel Gears. Milling Cutt's, Vert'l Mill'g Mach's. R. M. Clough, Tolland, Ct.

"Pumping Machinery." New book, 450 pp, 8vo, 270 Eng. Prospectus free. W. M. Barr, 3223 Powelton Avenue, Philadelphia, Pa.

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De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles the "Common Sense," as heretofore sold by us and mailed to any address at $1 00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 203 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

The Chicago Meeting of the American Society of Mechanical Engineers.

(*Continued from page 7.*)

in various parts of the world at proper intervals.

Upon adjournment, the various divisions met in separate halls within the building, no professional papers being assigned for reading in the A. S. M. E. for this first meeting, but only the necessary business affairs and preliminaries which must always be attended to. At this meeting President Coxe presented his address, calling attention particularly to the advantage to be gained by such a meeting as this, with attendance at an exhibition where so much of interest in an engineering way is to be seen. He thought the opportunities here presented would, properly made use of, enable one to learn that which no school and no workshop would ever teach him. The enlargement of the horizon was of great importance, and such an enlargement often showed him who had gotten into a rut, and con-

cluded that what he was doing was the best possible way, that other people's scrap-heaps were filled with what he was inventing.

Following this address, Secretary Hutton made some announcements, in the course of which he stated that most of the ballots for new members that had been thrown out by the tellers for irregularity had been rejected because the signature had been made by a stamp instead of with the pen; and it was not thought proper to receive a ballot which might be of great importance to some one, which ballot could easily be cast by an office boy, or any one else who might have access to the stamp.

It was also announced that Mr. Porter's programme for the entertainment of the members of the A. S. M. E had been extended to include all members of the congress, an invitation which was accepted by many of the members of other divisions, since no special provision had been made for them in any other way. Circumstances made it necessary to depart from the programme somewhat as published in our columns July 27, the first deviation being caused by the wind, which was blowing so strongly from the north as to make it impossible for the whaleback steamer, the "Christopher Columbus," to land at the pier at the Fair grounds, no boats of any kind running to the grounds during the afternoon.

The party were kept together so far as possible, however, and after a visit of inspection to the novel craft in which it had been designed to sail, they took a special train upon the Illinois Central road and were taken to the terminal station within the grounds, from whence they followed the band furnished by the American Exhibitors Association, to the Multiple Speed Railway, which is located upon the pier at which the boat would have landed had it been able to navigate. After a trip around the pier the party marched to Music Hall, where Mr. Porter introduced Director of Works Burnham, declaring that to him was chiefly due the success of the World's Fair construction work. In his address of welcome Mr. Burnham disclaimed exclusive credit for what had been done, and accorded the honor to his associates and to the masters of the arts and sciences generally, many of whom had been employed directly upon the work, and others of whom had contributed to it in various indirect ways.

President Coxe responded briefly on behalf of the engineers, after which Mr. Porter announced that the various chiefs of the different departments of the engineering work would be found at the rear of the hall with their drawings; which they would show and explain to those interested.

From here the party went to the exhibit of Krupp, from which the general public were excluded, for the time being, in order that an exhibition of the movement of the guns could be given in such a manner that the entire party could see it.

This exhibit is one of the most interesting things to be seen at the Fair. It is in a special building which was designed and constructed in Germany, to be shipped here. Among the more prominent articles to be seen is the most powerful gun ever before seen in America, and one of the most powerful in existence. Its caliber is 420 mm. (16.54") diameter; length of barrel 14,000 mm. (41.66 feet); number of grooves in rifling 120; weight of barrel with breech closure 122,400 kilos (120.46 tons). It can fire a shot weighing 2,513 pounds, using 904 pounds of special powder, the initial velocity of the shot being 1,981 feet per second, and the greatest range with an elevation of 10½°, 9,680 yards. With a steel armor piercing shell weighing 2,205 pounds, steel armor slightly more than 3 feet thick can be pierced at a distance of 6,562 feet from the gun. The gun was constructed in 1886, and has fired 16 shots. It is intended to be used as a coast defense weapon, and is mounted in a carriage designed for that purpose, and weighing over 66 tons. There are a number of smaller guns of various styles and mounted in various ways, all these being elevated and depressed, or swung from side to side in concert at the word of command, like a company of drilled soldiers.

A very large collection of projectiles are shown, and a number of armor plates of various thicknesses, some of which have been fired into, the effect of the shot upon them being exceedingly interesting.

Among the forgings is a hollow shaft which was forged by hydraulic machinery. The length of the shaft is 82 feet; its diameter 11 81". The hole through it is 4 32" diameter, this hole having been bored. The shaft was machined on a lathe with 111.5 feet length of bed, 98.4 feet maximum turning length, and 4.58 feet swing. A finished three-throw crank-shaft, thrust shaft and propeller is shown, the extra plain lengths of shaft which are used in the vessel being left out in order to get the shaft into the building. It is such a shaft as is used on the modern twin screw vessels, its diameter being nearly 2 feet, and the length of the three shafts coupled together, 90 22 feet. The workmanship upon it seems to be of the highest grade. Numberless specimens of smaller forgings, steel castings, and other articles are shown, all of the highest excellence. To show the quality of the forgings and steel castings many of them have been "punished" under the steam hammer, cold, and the distortion possible without fracture is shown.

Leaving the Krupp exhibit, a visit was made to the power house of the Intramural Railroad, after which, in a special train upon that road consisting of six well-filled cars, the circuit of the grounds was made, some faster running than ordinary being done with the extra heavy train, owing to the fact that the regular stopping places were for the most part disregarded.

After a visit to the pumping station of Henry R. Worthington, where the principal pumps of the exhibition were examined, the party divided to follow individual preferences respecting the various attractions offered them for the evening, among these being the initial illumination of the wooded island.

TUESDAY, AUGUST 1.

Soon after 10 A. M., the appointed hour, the A. S. M. E. was called to order in Hall VII. of the Palace of Arts, the attendance being quite unexpectedly full considering the attractions elsewhere. About 300 were present and listened, first, to the presentation of the report of the Committee on a Standard System of Tests of Materials, this being presented by Mr. Gus. C. Henning. Owing to the fact that the work of the conference of engineers on this subject in Berlin had but recently been received there had not been sufficient time to edit the matter, translate it and present it to the society; but Mr. Henning gave in a general way what had been accomplished, promising that the matter would be fully prepared for incorporation with the record of the proceedings of the society.

Prof. Martin, of Berlin, who spoke in German, and whose remarks were translated by President Coxe, stated that the origin of the movement in Germany for a standard system of tests of materials was due to a letter written by Prof. Egleston on behalf of the committee of the A. S. M. E. in 1884.

The report of the Committee on a Standard Method of Conducting Locomotive Tests was presented by its chairman, Mr. William Forsyth. This report deals largely with the recently developed subject of shop tests of locomotives as practiced at Purdue University, and of which some account was given in our columns by Prof. J. J. Flather, issue of April 28, 1892. It will be remembered that in this apparatus the driving wheels of the locomotive rest upon wheels which are parts of that form of dynamometer which was devised by Prof. George I. Alden, of Worcester, and described with illustrations in our issue of June 19, 1890. In such a test it was thought by the committee that certain points pertaining to the performance of locomotives could be much better determined than by any possible road test. But it was recommended that neither the shop nor the road test should be depended upon solely, but that both should be used in determining the efficiency of any given locomotive. Full statements of the method of conducting both forms of tests are given.

In discussing the report Prof. Lanza seemed to think that possibly not quite enough attention had been given to determining the height of the water in the boiler at the beginning and conclusion of the test, as this was to be done by observation of the water glass only. He thought also that where only one indicator was used, the length of piping required would vitiate the accuracy of its performance. Mr. George Gibbs, mechanical engineer of the C. M. & St. Paul R R., who stated that he had much experience in testing locomotives, thought these points were sufficiently covered by the report, and in his experience he had found that there was practically no perceptible difference in the performance of the indicator whether one was used, or two—one at each end; while the single indicator plan was much the simplest and best for locomotives, for practical reasons. He took exception, however, to that part of the report which referred to the draft-gauge, the form recommended being a U-tube containing water and properly graduated, attached to the side of the smoke box, so that it could be read by the man on the front end. He stated that the opening and closing of the fire door would make as much as 50 per cent. difference in the reading of such a gauge, and for this reason as well as for the fact that the men in front have enough else to do he would carry this pipe back to the cab, where the man reading it could know whether or not the fire door was open.

A member, whose name was not given, objected to that part of the report which stated that if the water level at the end of the run was found to be below the level at starting, it should be raised by the use of the injector to the proper height. He said this was contrary to the recommendations of the society in respect to tests of stationary boilers and was wrong, because the water so put in would not be fully heated by coal charged against the engine.

Prof. W. F. M. Goss, of Purdue University, then presented his paper on "Tests of the Locomotive at Purdue University." This paper is supplementary to one presented last year, and describes the results of twenty tests of the locomotive made during the past school year. Professor Denton, of Stevens Institute, discussed the paper, bringing out in a strong light the eminently practical features of this method of testing, and calling attention to the fact that with this apparatus it was a very easy matter to secure and maintain any desired condition as to pressure, speed, point of cut-off, rate of combustion, load, etc., in fact, to do those things which all experience had shown could not be done upon the road with any degree of accuracy, leaving for the road test those points which could be determined only on the road. The form of dynamometer used had proven to be of the greatest value in this work, the mere turning of a small valve serving to change the load at will, and when once set the load remained constant for any desired time. In this way it had been found entirely practicable by the committee, who had inspected the apparatus, to get and steadily maintain any desired load upon the locomotive up to 250 H. P. for each wheel, or a total of 1,000 H. P., and there was no burning of blocks nor trouble of any kind. He thought a committee of the society should be appointed to make a test of a simple and of a compound locomotive, using this apparatus, the use of which had been tendered by Purdue University for that purpose. In his opinion such a test could be conducted without prejudicing the interests of any locomotive builders, and would do much to settle some points which are now in dispute regarding the comparative merits of the two forms. The result of such tests ought at least to furnish a key to the results obtained by road tests.

During the presentation of the paper, Sir Benjamin Baker came in, and, in looking over a copy which was handed him, was seen to be making a few hasty computations. At this point he arose and said that he sincerely wished he had had possession of the paper about two months earlier. He had been in the witness box for two days where the point at issue had been the extra cost of lifting the traffic of a railroad over a bridge made high enough to clear the masts of vessels in a canal, the English courts having decided that the canal company should pay the railroad company damages for this extra cost. In his testimony for the canal company, he had maintained that one ton of the Welsh coal used in the locomotives of the road would lift 600,000 tons one foot high, while those on the other side had maintained that it would not do nearly so much—in fact, about 400,000 tons only. He was pleased to note that the results obtained by Professor Goss and given in the paper, when corrected for the difference in value of the coals used, sustained his opinion, being about 641,000 tons one foot high. Just before leaving England he had talked with Mr. Webb regarding the performance of one of his latest compound locomotives, Mr. Webb informing him that these locomotives were now carrying traffic over the road at an expenditure of two ounces of coal per ton per mile, a performance which was regarded as exceptionally good.

The secretary then presented in abstract Mr. A. Mallet's paper on Locomotives Operating by Total Adhesion on Curves of Small Radius; which was followed by that on the Development of the Compound Locomotive by A. von Borries, of Hanover, Germany. This paper is mainly historical, and called out some discussion by Mr. J. H. Cooper, Mr. Supplee and others, tending to throw light upon the first builders of the various forms of compound locomotives. Mr. Cooper thought that to William Baxter was due the honor of building the first two-cylinder compound locomotive that went into practical use on the road; while to Mr. Batchelder was due the use of the first reducing valve for equalizing the work done in the two cylinders. The author of the paper thought that the compound had a smaller range of economical working than the simple locomotive, a point which seemed to be doubted by Mr. Gibbs. The final paper of the session, that of Mr. Albert Schneider, of Germany, was presented by the secretary and discussed by W. Hildenbrand, of New York, who had translated the paper. Mr. Hildenbrand is the representative in this country of the Abt system of rack railways, with which the paper chiefly deals, and was the engineer in charge of the work upon the Pike's Peak R. R. The paper is a very thorough and comprehensive one with many illustrations and details of both roads and rolling stock. In discussing the paper Mr. Hildenbrand said that the loads which could be carried over such a road depended more upon the locomotives than upon the road. With locomotives suitable for the work, loads of almost any desired weight could be handled without trouble. In answer to a question, he stated that the extra cost of such a road over the ordinary road without rack is about $15,000 per mile; but owing to the fact that a much shorter road could be constructed between two terminal points in a hilly or mountainous country where the grades made possible by the rack were used, the total cost of the road would be in most cases less, and the operating expenses as well.

Mr. Carleton W. Nason at this point presented a report of the Committee on Standard Flanges for Valves, Pipes, etc., but owing to the combined facts that it was read in a very low tone of voice, and that a number of engines of the Illinois Central R. R. were just outside the windows shifting cars, it was entirely inaudible. The conclusions of the committee will, however, be given in our columns in due time.

(To be Continued.)

W. E. Crane has become connected with the New England Engineering Company, of Waterbury, Conn., as engineer, with an interest in the business.

Things to See at the Fair—Continued.*

FRIEND HEMENWAY: A mechanic is supposed to spend most of his time in Machinery Hall, and the AMERICAN MACHINIST is expected to publish only such things as relates to mechanics, but then one will find in looking over the entire display at Chicago that pretty nearly the whole is mechanics, and that there is much for the machinist to see and learn outside of Machinery Hall. As the "Editorial Correspondent" is taking the work there more in detail and in a more consistent order than was possible in a ten days' visit, or than you are likely to do, let us take a look at the Agricultural Building, and see what a wonderful display the farmers and agricultural implement makers have brought together. The building is itself in keeping with the others, fronting the Manufacturers' Building towards the north, with the gilded statue of the Republic (which James Dredge says occupies but does not adorn the east end of the basin) between the two. People so like a thing covered with gold that I hesitate to single out this as any worse than the others; in fact, I am afraid the gold covered a multitude of sins in my eyes; any way, it is big among the big things, and helps to fill in the picture. Entering the building in the center at the front, the very place where people are least likely to enter, brings one under the dome, one of the least pretentious of all the domes on the ground, and yet the most impressive. See it once.

This Agricultural Building consists of a main building and an annex like the Transportation Building and Machinery Hall, and it proves a good arrangement; cheap to extend to meet unexpected wants. One may notice the show pieces in the main building, and the novelties and the business end of agriculture in the annex.

While the building inside has but little if any pretension (or at least much successful pretension except the dome), inside the agriculturists have in many ways done themselves great credit in the extent, ingenuity and taste displayed in the setting out of the products of their respective countries and States. Each certainly is deserving of more than a passing notice, but for a mechanic the one from some corn-raising Western State will be thought the most interesting. A section 20x40 feet, perhaps, is surrounded by a base or row of columns and a cornice with some kind of canopy. The base is laid off in pilasters and panels, the columns of glass tubes 10 or 12 inches in diameter, and everything but the columns covered with the product of the farm. Bases, caps, borders and moldings are made of or covered with grain, grass or split ears of corn, slices cut from red ears of corn making rosettes that one could easily mistake for something more expensive. The glass tubes are in semblance converted into granite and variegated marble columns by simply filling the inside with barley, oats, wheat, corn, peas, and other farm products. Red, yellow, and white corn intermixed bring about very pleasing results, and this is but one of the hundred such exhibits. One is not likely to spend but an hour in this section when a day would be insufficient, but we do as you will do—hurry on to the annex where the line shafts are spinning around and the agricultural machines go jigging along. How little we engine and machine tool builders know about the real hard study and protracted experimenting that has been expended to produce the results that at present constitute the working elements of modern agricultural machinery. The material to be operated upon, ground, hay, grain, corn and manure, do not lay flat, stand plumb, or stay where put like solid material, and experimenting can only be carried on at suitable seasons of the year.

The thought and class of workmanship is different from machine tools; the work has been devised by men whom scholarly people call uneducated, and the most difficult problems are solved by marvelously simple means The trained engineer may look the whole field over without finding much, if anything, that he would do in that way, and he would not find much that he could do in any other way. Before making a reaper, self-binder (which by the way will do work that the most expert hand worker cannot accomplish), a modern thresher, a cow milking machine, a self-balancing milk separator, a tedder, corn cutter and husker, or a rice and coffee hulling machine, he would have to unlearn the science of statics, thermo-dynamics, kinematics, mathematics, pneumatics and hydraulics, and do as the farmer boy has done, go out in the sun-scorched field with his jackknife and chisel, and whittle, cut and try. Not only try this year, but the next, and the next..

I wonder if the thinking men realize what these farm mechanics have done for the world; changed the life of millions of working people from drudgery to an endurable occupation; increased the food product of the world, so that in place of starvation there is abundance; and what credit, what glory and honor, what medals, emblems or decorations, what laurel wreaths, diadems, statues or monuments? None, while an immortal name is the reward for writing the twenty-page story of Rip Van Winkle, the poem of Tam O'Shanter or The Heathen Chinee. Oh, but you may say, the inventor works only for the value of the patent and the hope of reward. Not a bit of it. The hope of reward has no more to do with it in his case than in the case of the man of pure science who spends "his life for truth alone." It is no more creditable nor true to say the inventor works for money, than to say that the scientist works for glory, and if both were true one is as creditable as the other. I hope our mechanics will look around the field of agricultural machinery if only to see the things that ought not to work, but do, and things that they would not do that way. If they want to see a piece of machinery with a "head on it," see the little trap on a self-binder that ties a knot in a string. If they want to see a machine work that ought not to, see the rice and coffee huller, that do that job without an element in them but a revolving shaft, that scarcely any sane man would think possessed qualities applicable to the duty.

One leaving the Agricultural Annex by the rear will be in sight of the grove of windmills. My day was a hot quiet one, with no wind to blow the mills and no exhibitors to blow up their merits. They all looked as if they would go in a fair wind, and go to pieces in a strong one, and likely one will find this fear pretty well justified when traveling through a section well supplied. I could not help wonder how these machines would compare with the sixty-foot sweeps of the Holland mills; likely about as the work, the one pumping drinking water for the stock and the other pumping back the sea which is several feet above half the tillable land of that wonderful country.

JOHN E. SWEET.

* By permission.

Says it is Not New.

Editor American Machinist:

We note in your issue of 3d inst. a cut of turret lathe purporting to be built by F. H. Crafts, Buffalo, N. Y. Permit us to say that we designed and built that machine (minus the peculiar driving device for which we disclaim any responsibility) in 1888 and illustrated it in catalogue issued in October, 1890. To substantiate our position we send you a cut. Our preserves have not heretofore been entirely free from poachers, but this is the cleanest steal that has come to our attention, and, we think, deserves notice.

BRIDGEPORT MACHINE TOOL WORKS.

We take back anything we have previously said as to the probabilities of an open Fair on Sundays. The matter has seemed to have been settled both ways on several occasions, but those who believed this to be so had not calculated on the supply of injunctions holding out as it does. It looks now as if there were enough left to last for a year or two after the close of the Exposition giving, during its continuance, those who believe in Sunday opening just about an even chance with those who want it closed. It is an unfortunate condition of things, but there seems no remedy for it.

The average market price in Birmingham for fair quality brass is from $182 47 to $189.78 per ton, net. This delivered, say, in Philadelphia, would cost from $189.77 to $206.80 per ton, net, according to qualities, the latter being a good quality of brass. For gun metal various qualities are used, and price varies considerably. From $243.30 to $267.63 per ton would probably represent the average price, delivered in Philadelphia. Wages of brass casters average about $12 per week to irregular workmen; but skilled workmen of steady habits who work from Monday morning until Saturday night can readily earn not less than $24 per week. All are paid by the piece.—*Consular Reports.*

MANUFACTURES.

Frank L. Osgood is to start a machine plant in Bangor, Me.

The works of the Bridgeton (N. Y.) Iron Co. are being enlarged.

J R. Smith & Co. are erecting a grain elevator at Purcellville, Va.

Anton Rank has put into operation a paper box factory at Fort Dodge, Ia.

The Consumers' Paper Co. is building a strawboard mill at Westside, Ind.

It is said that the Ohio Forging Works, of Columbus, O., will remove to Athens, O.

Laramore & Freeman contemplate starting a knitting-mill at Cartersville, Ga.

P. H. Pallatier, of New Berne, N. C., contemplates the erection of a cotton-mill.

Thomas H. Thomas will establish asphalt works in Washington, D. C., at a cost of $20,000.

The New York Pump and Pipe Works Company will remove its plant to Morgantown, W. Va.

The J. & J. Rogers Co., Ausable Forks, Essex County, N. Y., has increased its capital stock.

An addition 100x62 feet will be built to the Hope Iron Foundry of Wm. Adams & Co., at Philadelphia.

The Columbian Iron and Wire Works Company has been organized by J. G. Raber and others at Canton, O.

The Grip Machine Company will probably erect an engine and boiler house at its factory at Malden, Mass.

The Mason Electric Co., of New York, has incorporated for the manufacture of primary batteries and motors.

The Shamokin Car Works Co., at Shamokin, Pa., contemplates the erection of an additional shop, 274x103 feet.

The Connable Veneer and Lumber Co., Memphis, Tenn., will soon be in the market for wood-working machinery.

The Northwestern Car Company, of Detroit, Mich., has broken ground for a 100x280-foot building at Oshkosh, Wis.

The Niagara Falls Power Co. will erect large buildings and expects to have the plant in operation by next January.

The Sterling Cold Rolled Steel Company has made arrangements to build a plant at Wilson's Station near Pittsburg.

The Duquesne Reduction Company has been organized in Pittsburg to engage in the manufacture of brass and other alloys, and of articles from the same.

The Virginia Plumbing and Heating Co. has been incorporated in Richmond to manufacture heating and plumbing material, with a capital stock of $5,000. G. W. Priddy is president.

The Coxe Iron Manufacturing Company, of Drifton, Pa., has been incorporated with $250,000 capital stock, for the manufacture of iron and steel. Alexander B. Coxe is treasurer.

The new cotton-mill company at New Stirling, N. C., has fully organized as the Riverside Cotton-mill Co., and charter will be applied for immediately. The capital stock has been placed at $40,000.

A company has been formed at Clifton Forge, Va., to control, introduce and manufacture J. A. Mockley's patent "twin type car coupler." J. A. Mockley, J. C. Carpenter, J. A. Roberts and J. A. Capel are interested.

The Columbia Mills, capital $600,000, have been chartered, at Columbia, S. C. This will be one of the largest cotton-mills in the South. Aretus Blood, of Concord, N. H., is president, and C. K. Oliver, of Baltimore, Md., secretary and treasurer.

The Dexter Folder Co., Fulton, N. Y., has issued a fine catalogue of paper folding machines, which will be of interest to printers and to others interested in the handling of printed sheets.

A charter for the Horry Cotton mill Co., of Board Landing, S. C., has been issued. The capital stock is placed at $100,000, and the erection of a cotton factory is proposed at an early date. The incorporators are E. Norton, L. D. Long, C. L. Johnson, J. A. McDermot, J. M. Oliver, J. A. Mayor and B. R. King.

The United States Glass Company is having plans prepared for two factories on its recently purchased site near McKeesport, Pa., and it is expected to have them ready to begin operations by September 1. They will each be fourteen-pot furnaces and will be of the very best construction, so built as to be as nearly fireproof as possible.

The Mahoning Valley Iron Company, of Youngstown, O., is having plans prepared for the erection of a large mill adjoining the already extensive industrial plant in that city. The structure will be entirely of iron, and absolutely fireproof. In it will be placed a 12 inch and a 9-inch mill, and the machinery will include all the latest improvements.

The McColl Manufacturing Co., of McColl, S. C., has lately increased its capital stock of $40,000 by about $25,000, and will use this extra capital to double the capacity of its mill. The plant is now operating 3,000 spindles, which is to be increased by 3,000. Sixty hands are now employed day and night. The new machinery has been purchased, and will be installed during July.

The Holly Mfg. Co., of Lockport, N. Y., are enlarging their molding shops. They are excavating and removing the largest stones ever handled in that city. Many of the men use their spare time in drilling holes in the solid rock which forms the bottom of the shop. When a sufficient number of holes have been drilled the employes vacate the building and heavy blasts are made.

Wm. Bayle & Sons, at Milwaukee, Wis., have in process of erection an entirely new plant. The foundry building will measure 300x120 feet; the molding, 130x75, two stories, while three separate structures, each 40x60 feet, will be occupied by the blacksmith shop, engine and boiler room and offices. The plant will be supplied with two traveling cranes of 20 and 30 tons capacity.

The Whiteley Malleable Casting Company, of Muncie, Ind., recently incorporated with $200,000 capital, has commenced work upon its buildings, which will cover five and a half acres of ground. The foundry is to be 536 feet long, the shipping department, consisting of two buildings, each 175x40 feet. The annealing department will be 420x76 feet. It is expected to have the plant under roof by October 1.

Reports from Buffalo, N. Y., say that the ground will be broken the present month for the works of the Co-operative Pottery Co., which is to remove there from East Liverpool. A grant of eight acres of land on the eastern boundary of the city and $75,000 in cash was the inducement made to the company to locate there. The plant will engage in the manufacture of Dresden china, and it is expected the works will employ 1,000 men within a year or two.

The new American Line steamers now building at Cramp's Yard, Philadelphia, will be fitted throughout with Worthington pumps, manufactured by Henry R. Worthington, New York. The order for the pumps also covers Worthington feed-water heaters, such as are now used on some of the fastest transatlantic liners, among which are the "New York" and "Paris" of the American Line. The Worthington pumping engines are to be used for the water supply of Osaka, Japan, thus, it is said, completing the circuit of the globe with these engines.

A Reading (Pa.) dispatch says: In contrast with the general tone of depression the Carpenter Steel Co. of this city announces that by reason of new contracts they will put in operation twelve new crucible furnaces on Monday next, and give employment to many new hands. They also announce that this week's wages, amounting to $6,000, will be paid in gold. The company has just been awarded the contract to furnish the War Department with 200 twelve-inch armor-piercing shells, which are similar to those recently tested at Indian Head. Each of the shells will weigh 850 pounds.

Wendler & Co., Carthage, N. Y., write us: We have bought the interests of the firms of Wendler & Spiro, engineers and architects, formerly of Watertown, N. Y., and of Munro, Spiro & Wendler, founders and machinists, of Carthage, N. Y., and will conduct the business of both firms under the name of Wendler & Co., engineers, founders and machinists. We have also secured the patents for special machinery which were controlled by Wendler & Spiro, and it will be our aim to furnish our patrons at reasonable prices with machinery first-class in design and workmanship. In order to meet the increasing demand of our special machinery, we have decided to enlarge the capacity of our shops, and thus will be able to fill orders on short notice.

Machinists' Supplies and Iron.

NEW YORK, August 5, 1893.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $14.50 to $15.00. No. 2, $13.50 to $14.25; Gray Forge, $12.25 to $12 50 Southern brands of good quality are obtainable at $13.75 to $14.50 for No. 1 Foundry; $12 50 to $13.50 for No. 2 and $11.75 to $12.50 for Gray Forge.

Antimony—The market is dull. We quote L. X., 10.15c. to 10¼c.; Cookson's, 10.25c. to 10½c.; Hallett's, 9.80c. to 9.85c., and U. S. French Star, 10½c.

Copper—Lower prices prevail. Lake Copper is offered at 9.95c., but the best bid is 9.55c. for future delivery, or 9.50c. for spot. Casting Copper is held at 9.60c. to 9.75c.

Lead—The market is weak; buyers bid 3 20c. to 3.25c., while the selling price is an unknown quantity. Some business could be done at 3.30c.

Lard Oil—Prime City is quoted at 65c. to 66c.

Spelter—The market is dull; quotations are nominal at 3.90c. to 3.95c.

Tin—The market remains dull. The spot price has declined to 18.65c., August, 18.80c., September, 19.17½c., and October, 19.75c.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Mech. draftsman and designer of 1st class ability desires employment. H. H., Box 62, Am. Mach.

Wanted—Pos. by metal pat. maker on locks, gen. hdware & novelties, 20 yrs' exp. Box 66, Am. Mach.

Wanted—Draftsmen to sell new comb. triangle, pat. protractor, etc. D. J. Kelsey, New Haven, Ct

Wanted position as sup't or foreman by machinist and toolmaker; large exp. in tool and dynamo building. Address Box 46, Simsbury, Conn.

Experienced designer and engineer of 10 years' American and 10 years' German practice is open for engagement. Box 63, American Machinist.

Wanted--First-class foreman of shop building machine tools exclusively. Must be practical and energetic. Address "M.," Am. Machinist.

Wanted—Pos. by draftsman and designer; shop practice. Junior member A. S. M. E. Tech. grad. 4 years draftsman. Box 431, Elgin, Ill.

A mechanical engineer, graduated, with wide general experience, and expert in dairy centrifugal machines, wants position. Box 65, Am. Machinist.

Pattern maker, 30, first-class, thoroughly experienced, good draftsman, steady habits, good refs., wants employment. A. Bunting, Streator, Ill.

Wanted—Pos. by thoroughly prac. mechanical engineer and 1st-class draftsman and designer, 23 yrs' exp., highest testimonials. X., Am. Machinist.

Wanted—Pos. as assistant supt. or draftsman on machine tools or engines by Junior member A. S. M. E. Highest references. Box 67, Am. Mach.

Wanted—Position by a first-class tool maker. Ten years' experience as foreman of tool room. Address Tool Maker, American Machinist.

Wanted—Position by brass founder. Three years pattern shop, and 3 years foundry, and 6 years mach. shop. Thorough knowledge modern methods, tools and mixing alloys. Box 64, Am. Mach.

Shop agents for Carr's surface gauge and key rule clamps; liberal discounts; send for circulars; 2,000 gauges sold in past six months The Hoggson & Pettis Mfg. Co., New Haven, Conn.

Wanted Partnership—A mechanical engineer (38) good draftsman and designer, has three thousand dollars, with services, to invest in a well paying machine shop or foundry. Best of experience and reference. Box 59, American Machinist.

Wanted—Supt. of motive power for large establishment having 2,000 H. P., in plant of compound and triple expansion eng; must thoroughly understand theory and practice of boilers, combustion and steam engineering, and be able to attain maximum economies and reliability. Address, with full refs. and exp., to "Kensington," Am. Machinist.

+ MISCELLANEOUS WANTS +

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d hd lathes & planers. S. M. York, Clev'd, O.

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa.

Agents Wanted—Scientific Machinist, Clev'd, O.

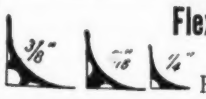
For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Co., Cincinnati, O.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Rubber, metal and composition patterns for carding & grouping; small rubber & metal work to order. John T. Usher, 116 E. 54th St., New York.

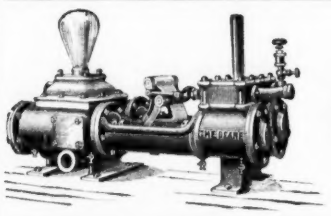
We will pay 50 cents each for copies of the American Machinist of December 4, 1886 issue, must be unsoiled and in good condition. American Machinist Publishing Company, 203 Broadway, New York.

Flexible Metallic Fillet



For Pattern Makers. 8 Sizes.

H. WHITE, 44 N. 4th St. Phila. Pa.



THE DEANE

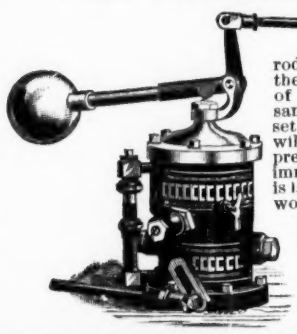
OF HOLYOKE

STEAM PUMPS

DEANE STEAM PUMP CO.,

HOLYOKE, MASS.

THE MASON PUMP GOVERNOR.



The Mason Pump Governor is to the direct acting steam pump what the ordinary ball governor is to the steam engine. It attaches directly to the piston rod of the pump and operates a balanced valve placed in the steam pipe, thereby exactly weighing the amount of steam to the needs of the pump, and economizing the same. By using the Mason Governor, you can instantly set or change your pump to any required speed, which will be maintained in spite of variation in load or steam pressure. As all the working parts of the governor are immersed in oil, the wear is reduced to a minimum. It is largely used on vacuum pumps, deep well pumps, water works pumps, ice machines, and all classes of pumps requiring an uniform strike.

For large duplex pumping engines a special governor is made, fitted with double parts and connected with both piston rods, thus insuring perfect regulation for every portion of each revolution of the engine.

MASON REGULATOR CO., Boston, Mass., U. S. A.

Crescent Steel Co.

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STEEL for Lathe and Planer **TOOLS**, Cold Chisels, Punches & Dies, Milling Cutters, Molding Bits, &c. **SHEET STEEL**, Polished **Drill Rods**, **SPRING STEEL**, Machinery Steel, **COILED SPRINGS**, Steel Forgings, **ETC.**

FINE TAPS, DIES, REAMERS, Etc.

LIGHTNING AND GREEN RIVER *Screw Plates.*

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WILEY & RUSSELL MFG. CO., Greenfield, Mass. SEND FOR NEW CATALOGUE.

SOMERS BROS., Decorated Tin Boxes, Third Ave., and Third St., Brooklyn, N. Y., May 4, 1893.

T. R. ALMOND, 83 Washington St., Brooklyn, N. Y.

Dear Sir—In reply to your inquiry regarding your Right-angle Counter-shaft, which you sold us at the time we fitted up our new buildings in 1885, we are pleased to report that we have had your coupling in constant use since that time, and that it has given us universal satisfaction. We have never had the least difficulty with it in any way, and by simply supplying new oil once in two months it has run continuously since that time without any kind of repairs or overhauling, and is now in as good a condition as when we bought it. By keeping its working bearings well supplied with oil the wear is imperceptible. This coupling is suspended to the iron column or beam, and is very rigid in its settings, hence it has not shifted or moved a particle by any warping of beams, and is directly connected with the shafts at right angles. The driving line being 300 feet and the driven line about 200, of 2-inch shafting. Yours very respectfully, Somers Bros.

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"THINKING"

Thinking all the time how we can best merit the patronage of plant owners. Our thoughts always take a gearing channel. We think to benefit you if you care to benefit yourselves. If you use our MACHINE BOLTED gear wheels, made from SPECIAL PROCESS charcoal iron, you will not think—you will know that our gears will benefit you.

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PITTSBURGH, PA.

TO PROVE THAT THE

ARMSTRONG TOOL HOLDER

FOR GENERAL

LATHE AND PLANER WORK

is a practical substitute for forged tools, and will save blacksmith work 70 per cent grinding, and 90 per cent tool steel, we will, to responsible concerns, who will fill out, sign, and forward to us, the following conditional order blank, send tools on trial, which if not found satisfactory may be returned at our expense.

.....189

ARMSTRONG BROS. TOOL CO.

78 Edgewood Ave., CHICAGO.

Send us via .....

The following Tool Holders for trial, to be paid for if satisfactory, if not, to be returned within 30 days.

.....No. 0—	⅜ x ¾ x	5 in.	@	$1.65..
..... " 1—	½ x 1 x	6 "	@	1.80..
..... " 2—	⅝ x 1¼ x	7 "	@	2.30..
..... " 3—	¾ x 1⅝ x	8 "	@	3.00..
..... " 4—	⅞ x 1½ x	9 "	@	3.80..
..... " 5—	1 x 1⅞ x	10 "	@	4.75..
..... " 6—	1¼ x 1⅞ x	12 "	@	7.00..

Wrench and 3 self-hardening steel cutters with each holder.

FROM OIL-CUP TO CYLINDER, EVERY PART DESCRIBED IN

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By J. G. A. MEYER, Esq. (Asso. late Editor of *American Machinist.*)

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Chapter	V.—Frames—Axle-boxes.	Chapter	XIII.—Engine Trucks.
Chapter	VI.—Driving-axles—Driving-wheels—Counterbalance.	Chapter	XIV.—Oil-cups—Cocks—Injectors.
Chapter	VII.—Main Rods—Side Rods—Crank-pins.	Chapter	XV.—Tenders.
Chapter	VIII.—Throttle-pipes—Throttle-valve gear—Safety-valves—Whistle—Pumps—Checks.	Chapter	XVI.—Useful Rules—Formulas and Data.
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Fine soft machinery castings to order from patterns or drawings. Contracts taken for castings and machinery. Let us make you a price.

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DEPARTMENT OF SCIENCE AND TECHNOLOGY.

The Day Course in machine work, of two years in length, gives a thorough preparation for the trade. Continuous practice is given with the different hand and machine tools, and practical constructive work is introduced throughout the course. Instruction in making working drawings is also given to this class. Evening Class meets on Monday, Wednesday and Friday of each week for course of six months, beginning September 25. This course affords the best possible opportunity for beginners at the trade to obtain a thorough training in the use of all the shop tools. Tuition for term of six months: Evening Class, $15.00; Day Class, $30.00. All tools and materials furnished without extra charge. In addition, this department affords instruction in plumbing, house, sign and fresco painting, algebra, chemistry, geometry, physics, steam, machine design and strength of materials. For tuition and further particulars, address, F. B. PRATT, Secretary.

Something New in Mechanics.

GEOMETRIC

BORING & TURNING TOOL.

An attachment to a drill press for boring any geometrical figure, such as round, square, hexagon, etc.

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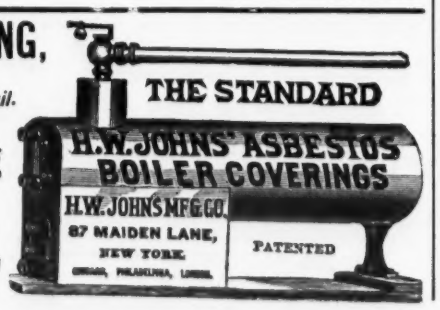

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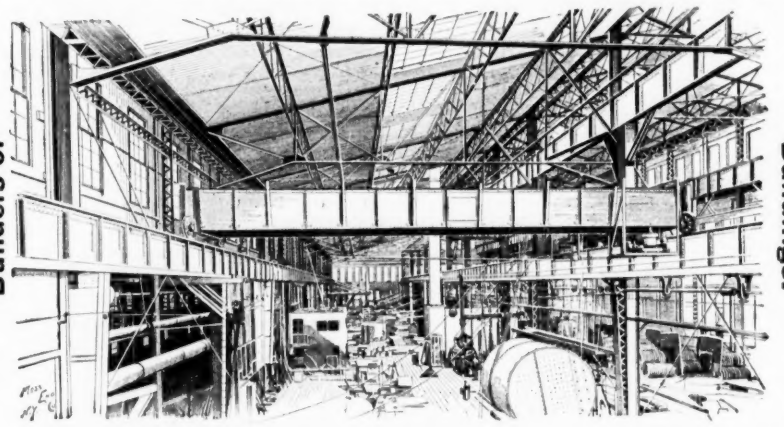

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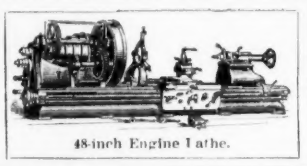

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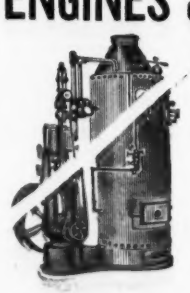

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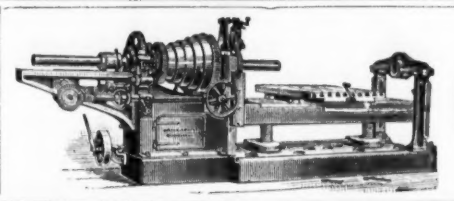

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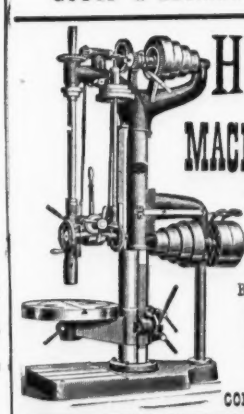

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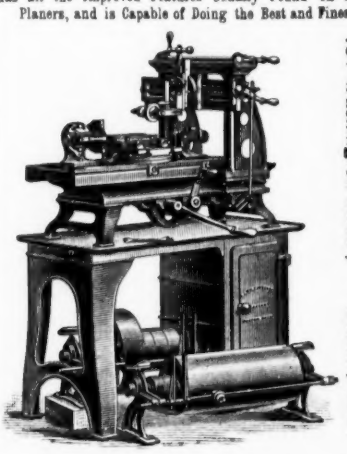

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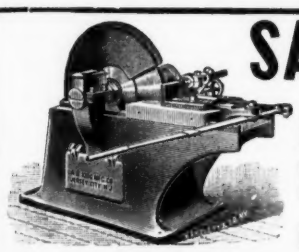

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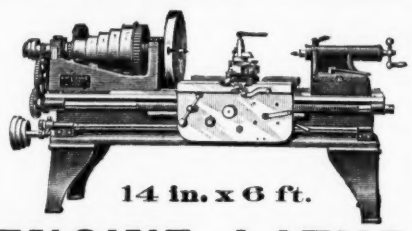

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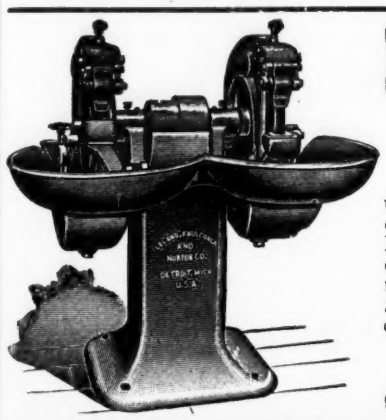

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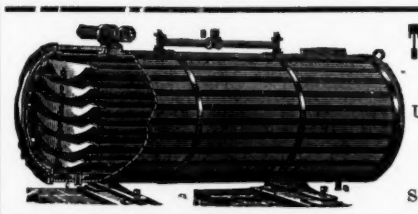

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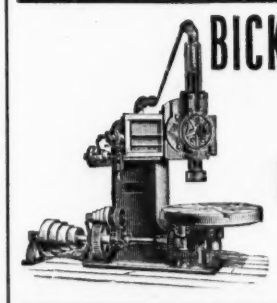

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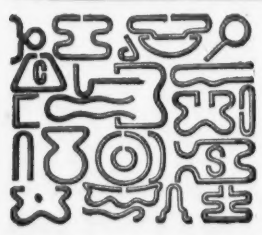

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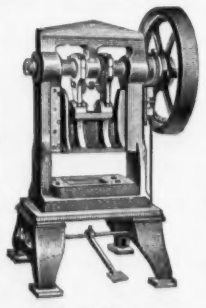

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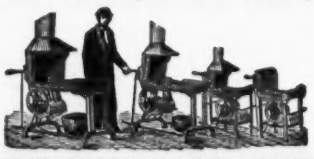

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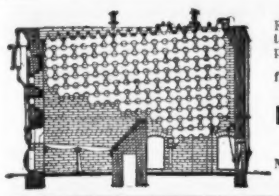

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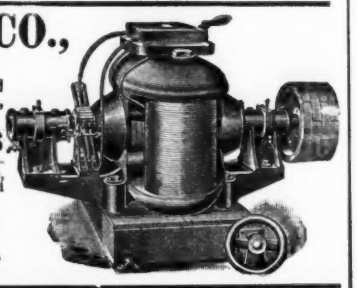

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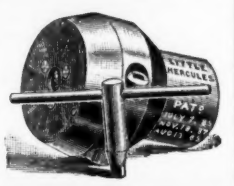

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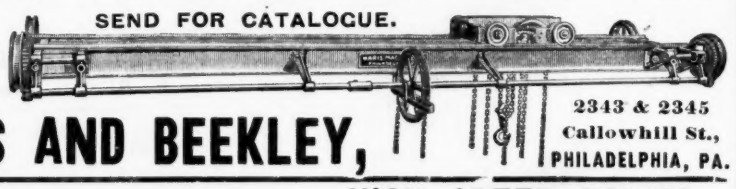

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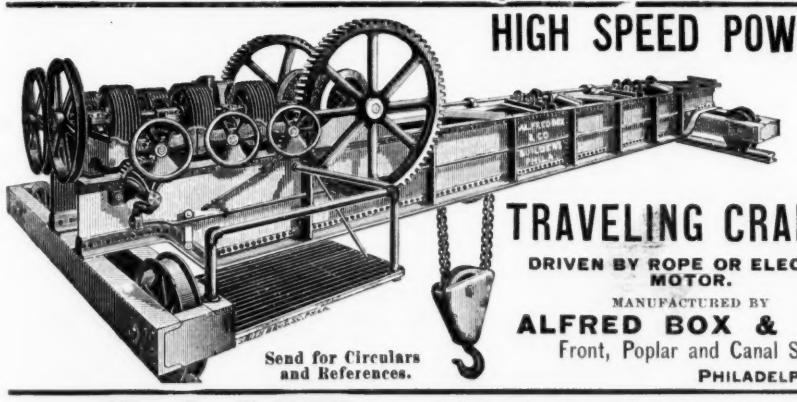

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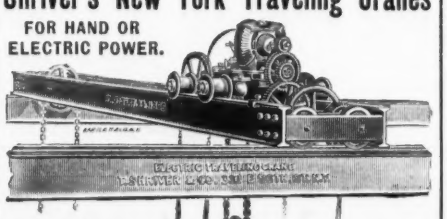

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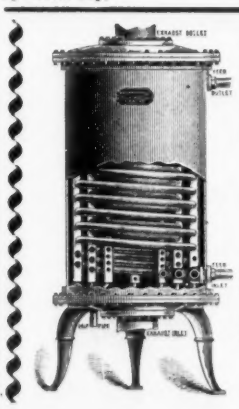

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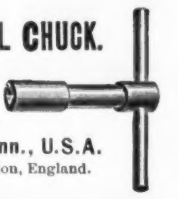

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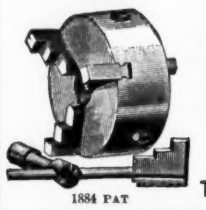
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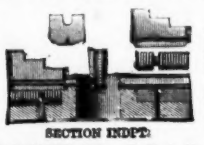
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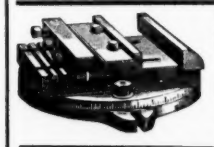

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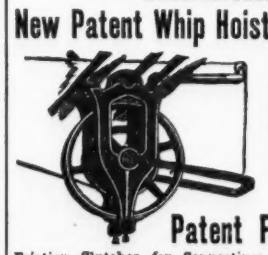

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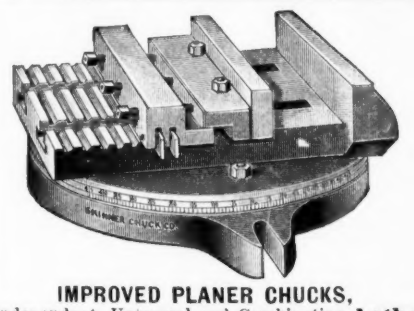

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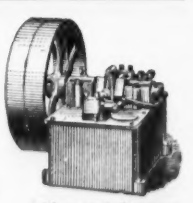
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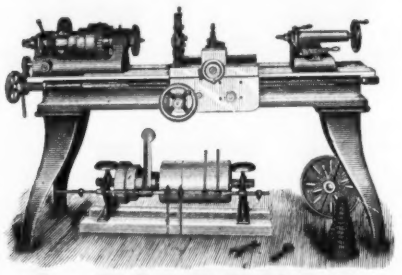

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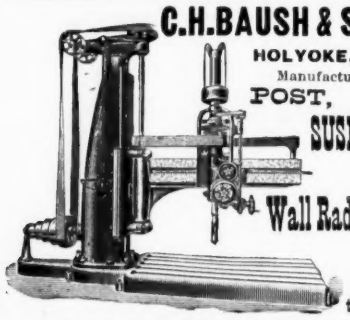

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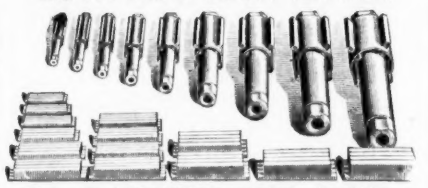

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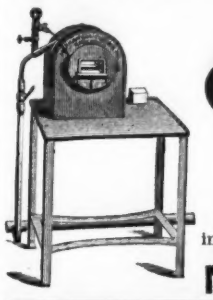

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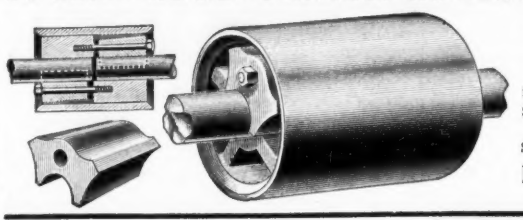

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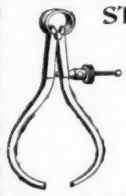

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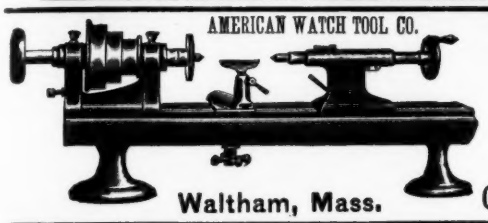

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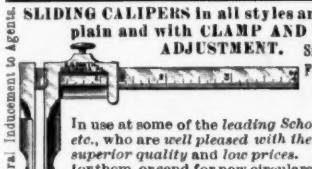

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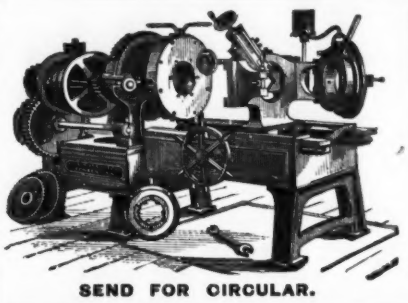

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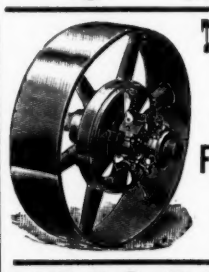

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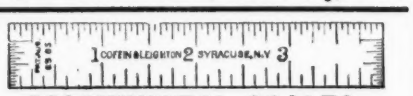

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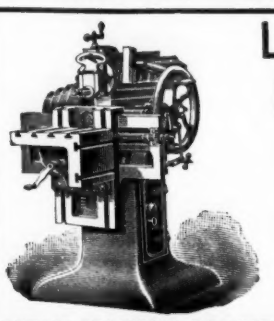

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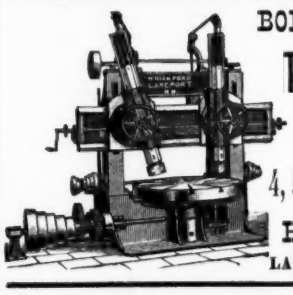

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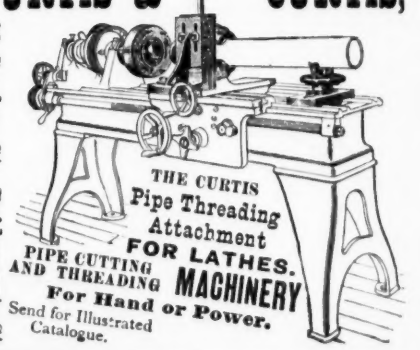

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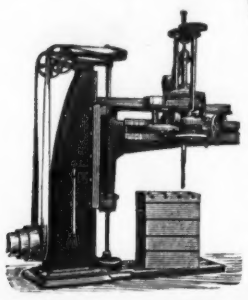

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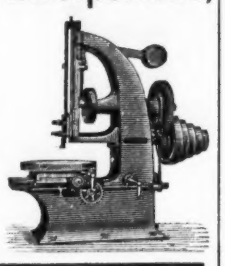

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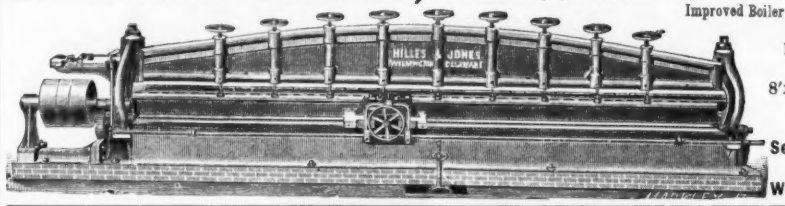

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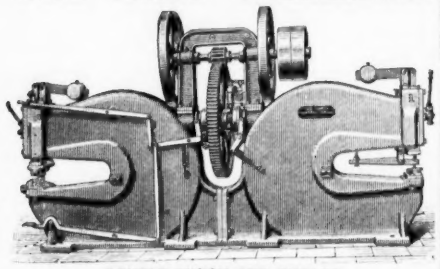

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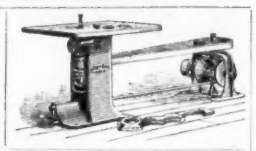

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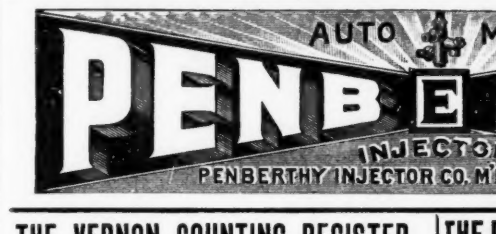

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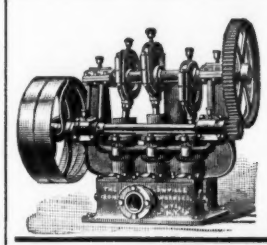

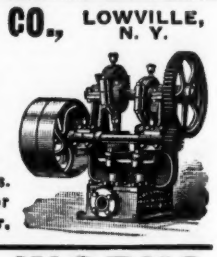

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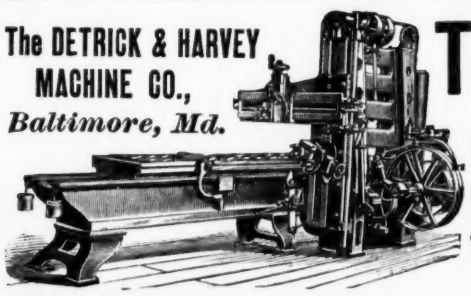

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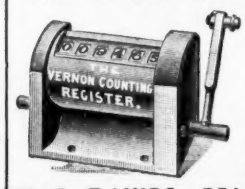

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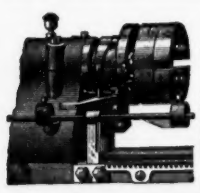

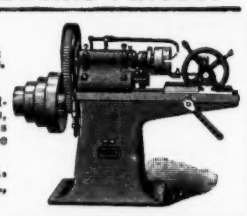

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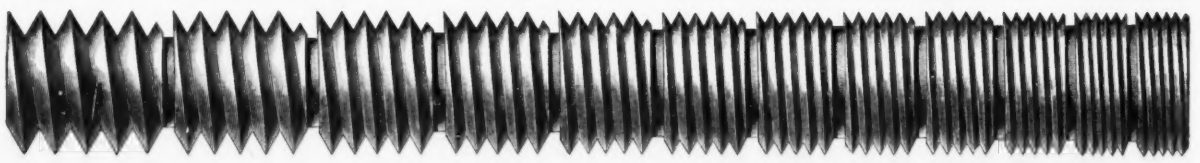

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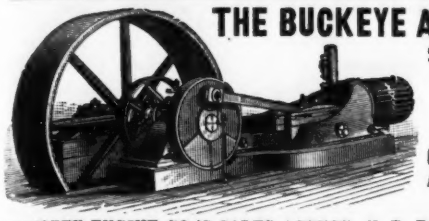

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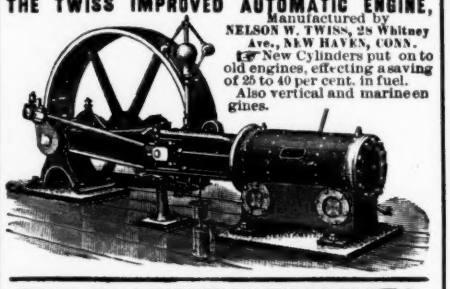

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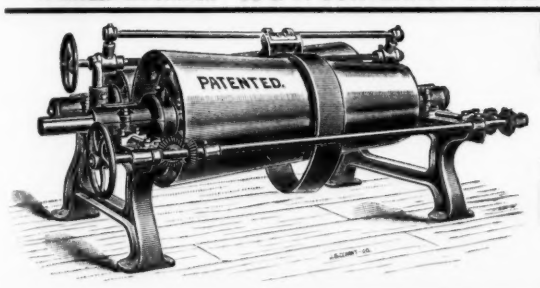

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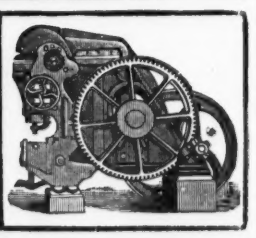

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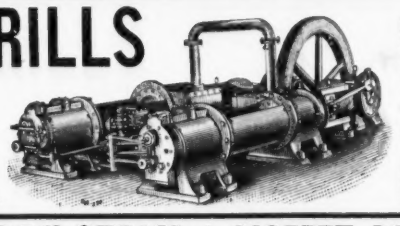

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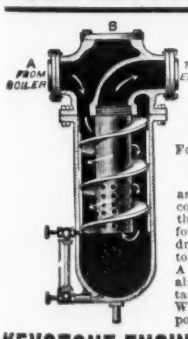

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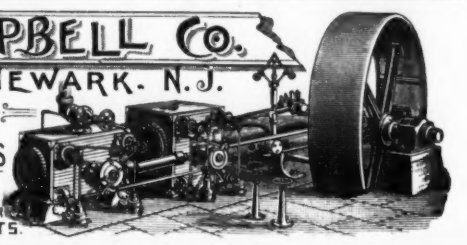

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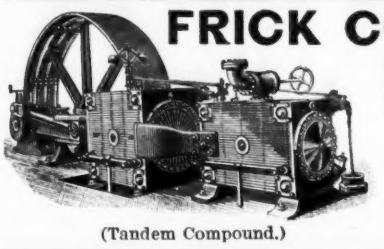

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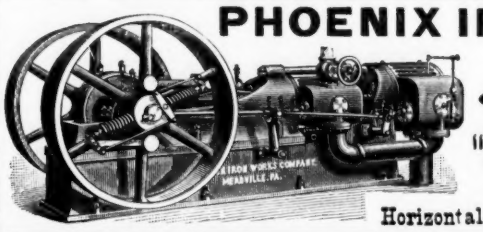

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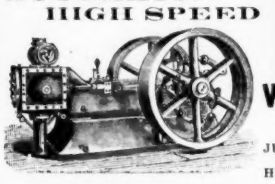

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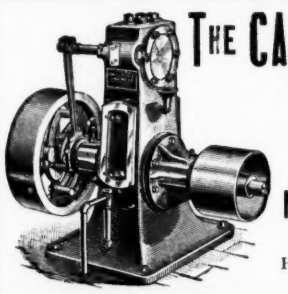

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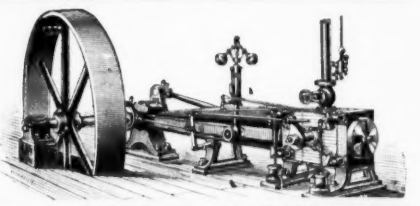

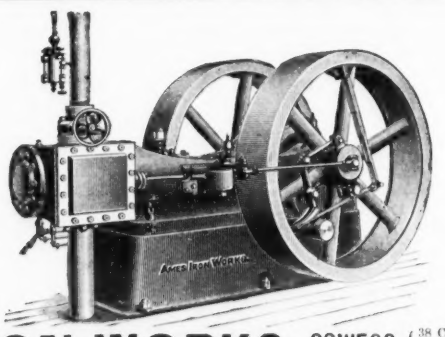

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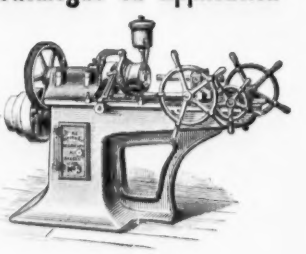

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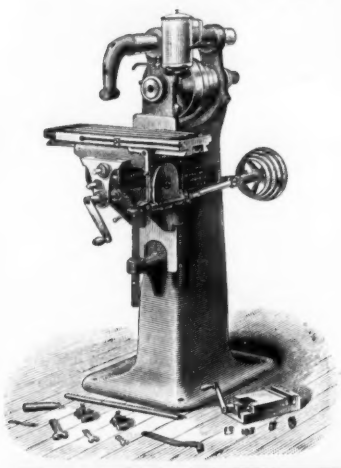

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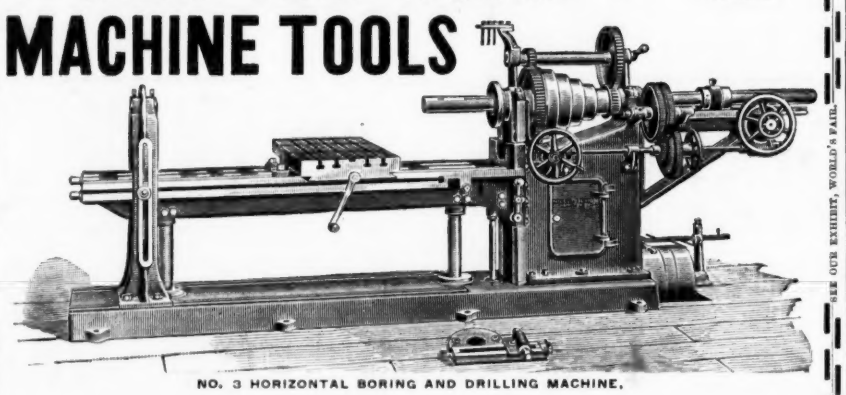

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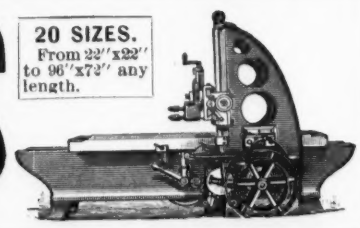

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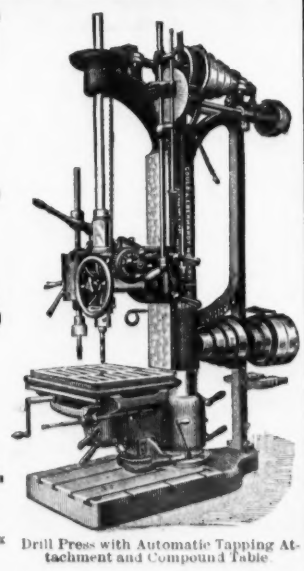

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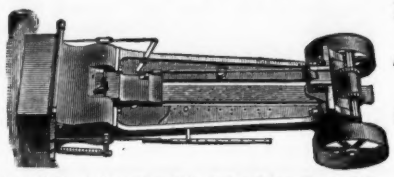

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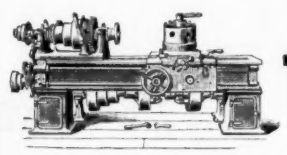

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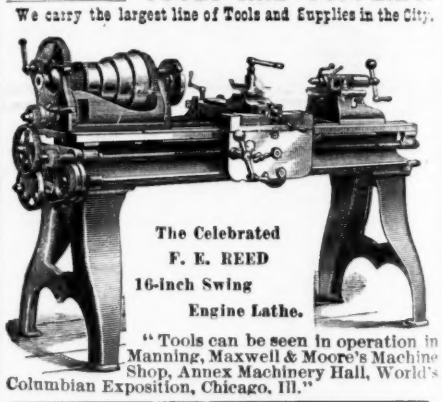

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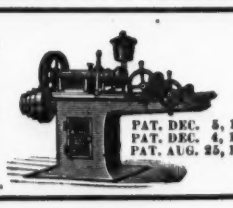

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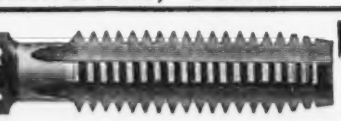

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